Subterranea

The Magazine for Subterranea Britannica

Subterranea Britannica **August 2022 Issue 60**

IN THIS ISSUE

Sub Brit Maginot Line Tour
Reporting the ROC - Tocsin Bang
Air-Raid Shelter Tunnels at Northfleet
Industrial Air-Raid Shelter, Halstead

Subterranea Britannica is a society devoted to the study of man-made and man-used underground structures and the archaeology of the Cold War. The society is open to all and its membership includes all walks of life.
Members are invited to contribute to this magazine even if this just means sending very welcome snippets from newspapers and magazines.
Contributors to *Subterranea* also give their permission for articles and images to be reproduced on Sub Brit's website.

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Front cover photo: *Members saw a range of Maginot Line forts in the May 2022 trip which is described in detail within this edition. This is Petit Ouvrage Immerhof which saw little action. After the French Armistice the fort was occupied in turn by the Germans, Americans, French and NATO before it was bought for preservation by the nearby town of Hettange-Grande. Because it was (unusually) constructed by cut-and-cover, the corridors within look and feel different to most Maginot forts. They have flat ceilings, made of concrete cast in situ, and feel more like an office block. Straight ahead leads to Combat Blocks 1 & 2 and the stairs lead up to the Barracks area. Photo Clive Penfold*

Back page upper: *Sub Brit members assemble outside Combat Block 4 of Fermont Gros Ouvrage on the recent Maginot trip. In the background are embrasures for 75mm guns. Photo Clive Penfold*

Back page lower: *Looking north along Tunnel Road, Reigate during the Sub Brit visit to Reigate Caves in February 2022. Tunnel Road is the oldest road tunnel in Britain and was built in 1823 as a short cut on the main London to Brighton road. It was in essence an early bypass for Reigate town and was used as a main road until it was itself bypassed and pedestrianised in the 1970s. A report on the Sub Brit visit in February 2022 will be published in Subterranea 61. Photo Clive Penfold*

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However the Editor reserves the right not to publish material without giving a reason.

The committee of Subterranea Britannica and the Editor do not necessarily agree with any views expressed and cannot always check the accuracy of any material sent in.

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Chairman's Welcome

Tim Wellburn

I must start by recording the passing, at the grand old age of 91, of another of Sub Brit's 'Old Guard', Malcolm Tadd. His key involvement in both Sub Brit and Wealden Cave and Mine Society (WCMS – of which he was President) was briefly acknowledged at the opening of our Spring Meeting. The full extent of his contribution to Sub Brit is described in his obituary in this issue. There was also a long obituary in WCMS's *News of the Weald 114,* focusing on his work for that Society and the fruition of his vision to open Reigate Caves to the public – a remarkable town-centre quarry that many of us have visited.

Our recent questionnaire was intended to inform Sub Brit's vision for the future. A summary of the replies to the quantitative questions was published in *Subterranea* 58, with a brief commentary. Comparison with the 2011 survey shows how the Society has changed in that period. We have since been working with this information and members' extensive free-form input to discuss what it tells us, and what we might change or do in response.

One strategic issue is that we, and Sub Brit, seem to have got older! While around half of our membership remains in the 45-65 age range, the proportion of those over 65 has more than doubled while that under 45 has more than halved. This is reflected in the longevity of membership: in 2021 twice as many people had been members for more than a decade than was the case in 2011.

This is good news and bad news. Clearly, Sub Brit's membership is loyal to the Society and, from other questions, it is clear that the general level of satisfaction with our activities remains high (notwithstanding that there is always scope for doing more and doing better, especially if more members step forward to help achieve this).

However, to ensure the longer-term future of the Society, we do need to find ways of attracting more younger members. This will require new initiatives and perhaps new offerings and changes in the way we do things. But equally, it is important that we continue to meet the wishes and expectations of our near 1,000 existing members. Squaring this circle suggests a strategy of evolution rather than revolution.

Sub Brit is open to all and, I hope, welcoming to all. We did not ask in the questionnaire about members' race, religion, sex or other personal characteristics (other than age group) because these did not seem relevant to our purpose. However, we should certainly be trying to encourage engagement in matters subterranean across the whole spectrum of the population, and we need to keep seeking ways to facilitate inclusive participation in our activities.

Whilst members' 'free-form' text responses inevitably reflected a range of viewpoints, there was also much common ground. We were clear that there were things we could learn from, and initiatives we could take, to try to make Sub Brit a more user-friendly, welcoming and inclusive organisation. Our conclusions and proposals are set out in this issue. Thank you again to all who took the time to complete the questionnaire and provide this feedback.

As always, the more members become actively involved in contributing to Sub Brit, the more we will achieve together. In my last 'Welcome' I mentioned the repeat Orford Ness visit organised by Dave Thomas for those who missed out on the first one. I didn't then know that Clare Grange had also arranged a repeat trip to Sizewell 'B' in association with this. Feedback from this joint member-organised double visit has been very positive. So well done Clare, too.

chairman@subbrit.org.uk

What I saw on my holidays

Dave Maguire

A cave at the seaside or a bunker in a field, made of concrete or of steel, buried at a depth or hidden on the surface, we want to know where you've been. A dark tunnel under a hill, a dripping mine or a concrete plinth, purpose unknown. *Subterranea* readers love this sort of thing.

Whether you've been on your own, or with friends or family somewhere hidden from the sun, and have recorded this with a couple of photos, perhaps you could write 100 to 200 words discussing the location? Even if you just want to know more about the underground place you've seen, why not ask the wide knowledge base of the Sub Brit community?

Should you have a few high-resolution photographs (even from a phone) of what you saw and a couple of hundred words for *Subterranea,* you can send them to dmaguire@subbrit.org.uk

No prizes, but many thanks!

SUBTERRANEA BRITANNICA DIARY

Summary of Forthcoming Events

2022

Sub Brit specific events

24 September Site visit to Radar Tower, Redoubt Fort and Beacon Hill Fort, Harwich

1 October Site Visit to Dumpy Level, Dover Castle

15 – 16 October Edinburgh Visits weekend.

27 October Visit to St Leonards & Deanhill Court Air-Raid Shelters

1 November Copy deadline for *Subterranea* 61

5 November Brompton Cemetery Catacombs visit

15 December *Subterranea* 61 published

2023

11 March Sub Brit Spring Meeting and AGM
Canada Water Theatre, London SE16 7AR (provisional)

21-23 April Sub Brit Europe Weekend, based in Oslo

Other Underground related events

September 2023 Hidden Earth Association (BCRA) annual caving conference
Dates and venue to be confirmed

For up to date information about these events
please visit www.subrit.org.uk/events
or contact the organisation concerned

If you know of other relevant events run by other societies, please let us know so that they can be advertised in the next edition and on the website

Minutes of Subterranea Britannica Annual General Meeting 2022

Saturday 23 April 2022, Canada Water Theatre, London SE16 7AR

The meeting was opened at 10.00 by the Chairman, Tim Wellburn, who welcomed all those attending, especially so many new members. 63 members were present. Tim passed on the sad news that Malcolm Tadd had recently died; he (and his wife Barbara) had been a stalwart of Sub Brit for many years – running the Newsletter, the Day Meetings, the Weekends and Secretarial duties. Malcolm was quite a character and we owe him huge thanks.

1. Apologies for absence were received from:

Tony Radstone, Robert Barnes, Janet Owers, Stephen Guest, Ian Jackson, Hugh Mackenzie, James Jenkins, John Poole, John Burgess, Alasdair Kergon, Jay Curtis, Nick Johnson, Adrian Lee, Richard West, Rhiannon Green, John Shere, Chris Wall, Ed Waters, and Hayley Clark

2. The Minutes of the AGM 2021 held online on 27 March were published to all members in

3. ***Subterranea* 57**, August 2021. It was proposed by Jason Holdcroft-Long and seconded by Nigel Wall that the Minutes were a true reflection of the meeting; the proposal was accepted by those attending, with three abstentions.

4. Sub Brit Annual Report for the year ended 31 December 2021. This has been published to all members on Sub Brit's website. Tim highlighted a few of our achievements of 2021:

- Strong financial position
- Membership at year-end = 984: up 3% on 2020 year-end
- 12,400 subscribers to social networking channels
- 13 '*In the Dark'* Webinars – available free to the public
- Three new issues of ***Subterranea*** magazine and wide-ranging Members' Forum
- Autumn Conference and Site Visits at Sywell, Northants
- Membership Survey to guide future development of the Society. Tim apologised that the developments as a result of the Survey had not been finalised and published yet; these should be in the next edition of ***Subterranea.***
- ***Subterranea*** editions 49–52 added to our publicly accessible archive
- All other Sub Brit publications – dating from January 1975 – have been added to this archive. This is a huge achievement.
- New grant of £2,700 to British Cave Rescue Council approved for casevac equipment. In addition grants have been made to Maidstone Girls School air-raid shelters, to Reigate Caves for a new rear entrance and to Grassington Moor.

5. Accounts 2021: Sub Brit's Accounts have been signed off by the Committee and Independent Examiner and have been filed at Companies House and the Charity Commission. They are also available on Sub Brit's website.

6. Elections of Officers and Committee. Tim highlighted the changes since the last AGM:

Co-opted: Dave Maguire, coordinating ***Subterranea*** content
James Buller, coordinating our Social Media
Jay Curtis, liaising on organising trips and visits

Changes: Neil Iosson is standing as Vice Chairman, to replace Richard West
Richard West will remain as Membership Secretary

Standing down: Bob Templeman, who was thanked for his many years of service to the Committee,
Chris Gray, Jason Hughes and Nick Gould (co-opted).

The motion that nominations for Sub Brit's Committee be considered *en-bloc* was proposed by Bob Clary and seconded by Mike Moore. The motion was carried unanimously.

7. The motion to elect the following Committee members was proposed by John Lill and seconded by Roger Gosling. The motion was carried unanimously.

The elected Committee for 2022/23 is:

Tim Wellburn	Chairman
Neil Iosson	Vice-Chairman (Website content)
Linda Dixon	Secretary
Tony Radstone	Treasurer
Richard West	Membership Secretary
James Buller	

Phil Catling
Jay Curtis
Martin Dixon
Dave Maguire
Richard Seabrook

8. Tim finished by outlining some of the events underway in 2022:

- Site Visit to Reigate Caves (February)
- "Inventive Vents" Bus Tour (March)
- Site Visit to Courtauld Industrial Group of 16 Air Raid Shelters, Halstead (March)
- Site Visit to Air-Raid Shelters at Maidstone Grammar School for Girls and Hollingbourne Zero Station (April)
- SB AGM & Spring Meeting and Visit to Crossness Pumping Station (April)
- First '*In-the-Sump*' Online Members' Informal Meeting (28 April at 18:30)
- Site Visit to Orford Ness Atomic Weapons Research Establishment (initiated by SB Member David Gordon) (May)
- Maginot Line Study Weekend (May)
- Repeat Site Visit to Orford Ness (organised by SB Member Dave Thomas) (June)
- Site Visit to Wartling Rotor Radar Station (July)
- Dumpy Level, Dover & Capel Battery (October) (with a repeat visit to be arranged)
- Edinburgh Study Weekend (15-17 October)
- … and more in the pipeline

The Annual General Meeting officially closed at 10.20, and was followed by the Spring Meeting.

Sub Brit Photography Competition

We want to use the talents of our members in a fun competition to showcase the fascinating underground places in Britain and beyond

Members can submit up to a total of five photographs into any of the following categories (except public)

We are looking for images that capture the atmosphere, history or character of a location or that express why a place is important. Apart from the International Sites categories, sites should be in Great Britain and Northern Ireland (including Channel Islands/Isle of Man)

Only members may submit entries except for the public category which is exclusively for non-members

Closing date 31st October 2022

Categories:

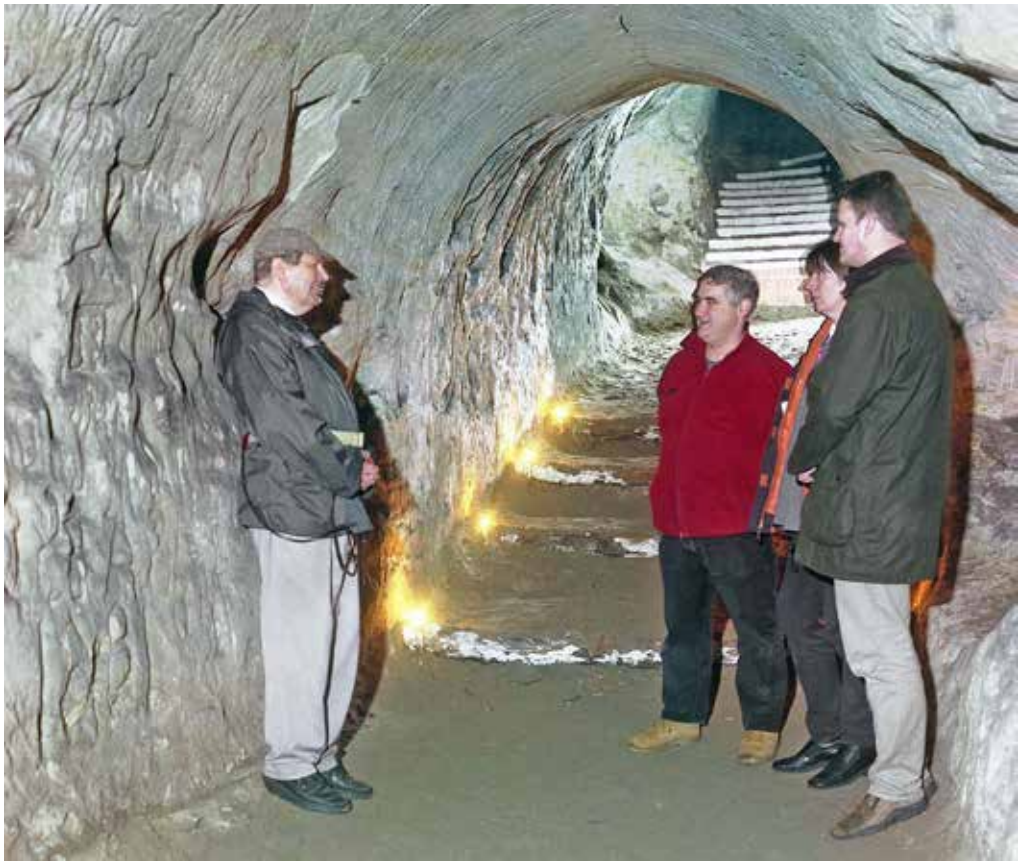
- Cold War
- Transport and Infrastructure
- Industrial
- Military
- Civilian
- Weird and Wonderful
- People and Places
- International sites
- Open (Members)
- Public – Open (non-members only)

How to Enter:

Further information and an entry form are at **bit.ly/subbrit_photo_22**

Malcolm Tadd 30 January 1931 – 20 April 2022

Martin Dixon and Peter Burgess



Malcolm leads a small party of visitors round Baron's Cave, Reigate in the late 1990s. Photo Nick Catford

For much of the 1980s and 1990s, Malcolm Tadd, with his late wife Barbara, was the powerhouse behind Subterranea Britannica. Malcolm and Barbara were not only our joint secretaries but also organised conferences, visits and study weekends; Malcolm also composed the Secretary's Newsletter which, in those pre-internet days, was our main medium of communication. It is with great sadness that we heard of Malcolm's death in April at the age of 91.

Malcolm was born in Brighton and in those pre-war years remembered seeing cavalry exercising on the racecourse, evening lamplighters and the muffin man, whose arrival was announced by the ringing of a bell. Whilst under ten he was diagnosed with diphtheria and spent time in a sanatorium, later isolating at home. After treatment he moved to a school near the South Downs where he spent many hours playing. Indeed it was here that he heard the first air-raid siren of World War II on Sunday 3 September 1939, the day that Britain declared war with Germany.

The sound of enemy bombers en route to London was to become a regular feature later in the war and Malcolm remembered exploring the relatively empty town and the army camps in the surrounding downs. He attended Varndean secondary modern school which he didn't particularly enjoy apart from the library which fed his great love of reading. At age 16 Malcolm passed his School Certificate and took Highers in Chemistry and Physics which he also passed. He then gained a BSc at the University of London and started his long career with Beecham Research Labs, working on antibiotics.

Around this time Malcolm developed a keen interest in long-distance walking. His walks included the length of the North Downs Way (100 miles in under 30 hours) and in his youth he was rated as the tenth fastest walker in the UK, narrowly missing out an Olympic Trial due to illness. He also took up rock climbing and it was while doing this in North Wales that he met Barbara in 1956. Barbara was a few years older than Malcolm and, by coincidence, also originally from Brighton. They were to spend 61 long and happy years together.

Malcolm is seen at the top (pyramid) entrance to Barons Cave c1990. Photo from WCMS

Malcolm and Barbara had a son and a daughter, Jim and Cathy, born in the early 1960s, and it was a decade later that Malcolm's interest in the underground was sparked – an interest that was to have long and lasting benefits.

In 1970, Malcolm was exploring the route of the old Croydon, Merstham and Godstone Iron Railway with his friend John Quick. When they arrived at Quarry Dean, they spotted some grubby cavers emerging through a gap in the hedge. On speaking to them, Malcolm discovered that they were from Chelsea Speleological Society (CSS). The cavers invited Malcolm and John to look around

During the 1990s Malcolm took part in a number of TV programmes relating to Sub Brit activities. He is seen here at the entrance to Marden Mine in Surrey in October 1993 speaking to London Tonight's reporter Jono Coleman. On this occasion Malcolm said "I feel safer underground than I do on the surface"

Carthorse Quarry at Godstone with Harry Pearman and Neil Young, where they were due to go that afternoon.

The leader of the CSS group gave Malcolm some contact details for Unit 2 (the predecessor of today's Wealden Cave and Mine Society, WCMS), which was the most active local club in the area at that time. John Quick, who is still a Sub Brit member, kept in touch with Malcolm and has a vivid recollection of that pivotal day which he was able to share with other attendees at Malcolm's funeral.

This chance encounter started a long involvement with WCMS, involving many active digs in the Surrey mines. Malcolm joined the WCMS Committee in the early 1970s and served as its President from 1989 until his death.

On 5 September 1997 Malcolm took part in a live late night chat show on Channel 4 called For Love Of Subterranea. Investigative journalist Jon Ronson hosted a panel discussion between people who enjoy exploring underground spaces

In the late 1970s Malcolm and Barbara joined Subterranea Britannica and Malcolm was true to the adage 'if you want a job doing then give it to a busy person'. They also made the acquaintance of and became firm friends with Paul Sowan. For a while, Paul found lodgings with Malcolm and Barbara; I recall Malcolm commenting that Paul was a thoroughly unsuitable tenant but that he himself was an equally unsuitable landlord! Little happened across Sub Brit that did not have Malcolm's involvement – and all organised in the days of snail mail, telephone calls and library research.

As Sub Brit changed and grew, Malcolm was very supportive of new interests and members. Unlike some longer-term members, he thoroughly endorsed the growing interest in Cold War bunkers as these once-secret structures entered the public domain. He was always ambitious in his thinking and supported fellow WCMS members in a campaign to reopen Baron's Cave in Reigate for public visits. It was largely down to Malcolm's energy and vision that the Reigate tunnel caves – first the east side and later those on the west – were also opened to visitors on a monthly basis.

Malcolm found the time to write a couple of books on Underground Reigate and the Industrial History of Tandridge in East Surrey. He was never happier than when actually exploring underground and in the 1980s he often supported Nick Catford on photographic trips to the Surrey mines by being volunteer tripod carrier. Malcolm and Nick were awarded the Margary Award of the Surrey Archaeological Society for their work in clearing the Oxted Lime Kilns. WCMS was awarded the Surrey Industrial History Group annual award in 2013 for their work in restoring Reigate Caves which Malcolm proudly accepted.

In January 1995 Malcolm is seen at the top of a ladder at Oxted lime kilns during clearance of the site. Photo Nick Catford

On leaving Sub Brit's Committee in the early 2000s, both Malcolm and Barbara were justly awarded honorary membership. Despite all his research, knowledge and organisation, at heart Malcolm recognised the sheer fun of underground exploration. He would say that it took everyone back to their schooldays, if not to the womb. His enquiring and mischievous nature is apparent in a number of TV programmes made around 1990 which featured Sub Brit. One of Malcolm's quotes from a 1994 broadcast is: "I love history, I love mystery; the underground fulfils this need in me."

Over the years, Malcolm has contributed to our appreciation of what lies beneath our feet and inspired

Malcolm receiving the SIHG annual award in 2013 on behalf of WCMS for the restoration of Reigate Caves. Photo from WCMS

Malcolm working in Tunnel Road (West) Caves, Reigate in 2004 prior to opening the caves to the public. Photo from WCMS

many others to the genre that we all love. His passing marked a sad day for underground enthusiasts, but what a legacy he leaves behind. In Malcolm's own words, "I had a wonderful life and a wonderful wife."

Mandolin causes havoc in the Devil's Arse

Dave Maguire

The largest natural cave entrance in Britain is now called Peak Cavern, so renamed in 1880 in order, it seems, not to offend Queen Victoria on her visit.

The Devil's Arse got its name apparently from the loud flatulent noises it made when draining after being flooded. However, on our visit in July 2022 we found that the noises being made were of a far sweeter nature.

The Cavern entrance has frequently been used for carol concerts and is now being used as a rock-music performance venue with a hardstanding for fans. It also has an awning over the stage, to protect the electrical amplification equipment from water drips and the musicians from electrocution!

The Devil's Arse is located in the Peak District in the Derbyshire town of Castleton. As you walk up to the cavern entrance you can appreciate that there are other, aesthetic reasons for calling it an arse.

Surrounded on both sides by two great 'cheeks' of rock, the valley forms a great 'crack' in the earth.

Hayseed Dixie are a comedic band with an Appalachian-style tribute to AC/DC. Given the location of the concert this was a 'rock' music diversion from their usual bluegrass.

According to the lead singer, the humidity within the cave was playing havoc with their instruments, especially causing ill-tuning (good excuse) and the mandolin's strings to snap.

He suggested that the strings of the instruments they were playing (bass guitar, guitar, banjo and mandolin) needed to be struck with twenty percent less force. He also went on to suggest that the mandolin player didn't have this skill set!

The antics of the dungaree-wearing (and not much else, shudder) mandolin player had us in stitches, particularly his tribute to the Devil's Arse that comprised wafting his rear end at the climax of their version of Bohemian Rhapsody "…any way the wind blows."

Guided tours of the Cavern are available; details, prices and booking at https://peakcavern.co.uk

NEWS

Miscellany compiled by Nick Catford

NEWS – ARCHAEOLOGY

Vast underground town discovered in Turkey

In mountainous eastern Turkey, a team of archaeologists has uncovered an underground town built around 2,000 years ago. The complex is thought to have held as many as 70,000 inhabitants who could have been early Christians hiding from persecution as the Roman Empire expanded.

The site is in Midyat, around 40km from the border with Syria, first settled by Anatolian Hurrians who were part of the Bronze-age Hittite empire. Later inhabitants were Assyrians and Persians, followed in turn by Greeks, Romans, Byzantines and Ottomans.

The rich history of the area, including ancient and medieval churches and monasteries listed as World Heritage Sites by UNESCO, attracts some three million tourists a year. But what they didn't know, until now, was what lay hidden beneath their feet.

The first underground chambers were discovered around two years ago by street cleaners in the modern town's historic district. Then a team led by archaeologist Gani Tarkan found dozens of similar structures, with corridors, wells, grain silos, living rooms and cult areas including a synagogue and a Christian church.

From the artefacts that remained and painted images on the walls it is thought that this underground complex dates from the second or third century AD. Yet the archaeologists believe that they have still only explored about 3% of the complex, now known as Matiate, and that it is of sufficient size to have sheltered between 60,000 and 70,000 inhabitants.

Was it a place of refuge? During the first century, Rome made no distinction between Jews and Christians; indeed, many early Christians were also Jewish. Discord came about after 64 AD when emperor Nero accused Christians of starting a fire that devastated Rome, and persecution continued on and off until 313 AD. In that year, emperor Constantine published the Edict of Milan which stopped persecution and paved the way for Christianity to become the official religion of the Roman Empire.

Thus in the second century many families needed to hide to avoid Roman persecution and it is possible that this huge underground town at Midyat was built for that purpose.

SOURCE: https://sciencepost.fr Translation of item in SFES newsletter, June 2022

NEWS – CONSERVATION AND HERITAGE

Oxgate bunker in northwest London could be saved from redevelopment

The three-storey brick-built 1940s office building at 403-405 Edgware Road in northwest London might appear a surprising candidate for heritage protection – but that is rather the point. It is intentionally nondescript above ground to avoid drawing attention to the subterranean war rooms deep in its sub-basements.

The complex, known as "Oxgate Admiralty Citadel", was one of three underground command-and-control centres in the suburbs – along with the Air Ministry's Station Z in Harrow and the back-up Cabinet War Room at the Paddock in Dollis Hill – which were to be used if Whitehall HQ buildings became inaccessible. The above-ground structures at the other two sites have already been demolished.

Developer AMAFHH Investments Limited, which owns the site, wants to demolish the lot and build a 7-storey hotel, with an underground car park and swimming pool. Although the building is locally listed, in documents submitted to the planning department of Brent council, AMAFHH's heritage consultants Bridges Associates argue that the citadel retains no interest above ground and little interest below.

The surface building at Oxgate. The two-level bunker is below ground. Photo Nick Catford

However, Historic Buildings and Places (HBAP, previously known as the Ancient Monuments Society)

says the trio of bunkers "hold significant heritage group value" and the external parts at Oxgate have considerable architectural interest "for their deliberately unassuming design and use of material technology to create what was then considered to be bomb-proof bunkers."

Bridges says in its heritage assessment that despite now being underneath a housing development, the Paddock bunker is the best of the trio, as a "much more complete survival of a WWII-era underground bunker" which saw more activity during wartime, while Oxgate was little needed.

Paddock owner Network Homes has stopped giving occasional tours of the war rooms and says it made the bunker safe and installed water pumps when building over it in the 1990s, but as a housing association "our priority is developing good quality homes that people can afford, so it is not possible for us to recreate the bunker as it would have been in Churchill's day."

Station Z, which housed RAF intelligence, map supply and Crashed Enemy Aircraft examination sections as well as a fallback HQ, is also listed locally. It was demolished above ground level in 1996 to make way for a Kodak factory, now also demolished. Harrow council's report on a new housing development at the site last year noted of the Air Ministry building: "Given that its structure and interest and value is contained below ground, it is considered that there would be no impact on this structure."

HBAP says Brent's conservation officer supports its view that there is insufficient reason to destroy the entire Oxgate site, but no final decision on planning has yet been made.

SOURCE: *Private Eye* 2022

Brunel Museum Rotherhithe receives lottery funding

The Brunel Museum at Rotherhithe has been awarded a grant of £1.85 million from the National Lottery Heritage Fund. This means that they can start work on their Brunel Museum Reinvented project, and we can't wait!

The three-year project aims to be completed by 2025 to coincide with their 200-year anniversary since work began on the Thames Tunnel. Thanks to National Lottery players, they can transform the site to become a more inclusive and accessible space to tell the fascinating stories of Marc and Isambard Kingdom Brunel.

The project will:

- Restore the existing Engine House back to its former glory and create a new gallery and experience
- Build a new Welcome Pavilion with a café, shop and accessible facilities
- Create a programme of free community events throughout the project
- Develop an educational programme to allow more people to learn about the history of the Brunels
- Display a collection of 30 watercolours known as the Thames Tunnel Archive for the first time

The project will see the Engine House restored to its former glory and a new gallery created. Within this, a brand-new exhibition will give everyone a chance to learn about the Brunels innovatively with new technology such as Augmented Reality, particularly fitting for this forward-thinking family. A new Welcome Pavilion will transform the visitor experience with accessible facilities, shop and cafe, enabling more people to visit and learn about this important heritage

The Thames Tunnel Archive is a collection of 30 watercolours that were painted by the Brunels throughout the Thames Tunnel project. They offer a unique insight into its creation. Exceptional for their beauty, artistic merit and technical detail, the drawings have been described as the most important Brunel collection ever to enter the public domain. They were buried in a family album for almost 200 years but were acquired by the museum in 2017 and have been waiting to find their permanent home on the walls of the restored Engine House.

SOURCE: Brunel Museum website, 19 July 2022

Maidstone grammar school to open its WWII shelter to the public

Maidstone Girls' Grammar School (MGGS), in Buckland Road, Maidstone, is located above three tunnels used by former students during World War Two air raids. Planning permission was granted for a visitor centre at MGGS following recently completed restoration work. The school says it hopes to open the tunnels to the public in October 2023.

Benches used by students during the war years are still inside the tunnels and chalk inscriptions can be seen on the walls. Author and former headteacher at MGGS, Mary Smith, has written a book about the tunnel's history. Ms Smith said: "I was just amazed. We didn't know if there was going to be anything left there at all. We removed the concrete then went down the steps in trepidation. It was just mind blowing. I think particularly having these chalked lessons on the walls was just stunning. It looked like ghosts of lost learning."

Former pupil Inga Mayor, 91, used the tunnels as a schoolgirl during the war. "The siren went, you got up and you came down to your space in the tunnel. Same

tunnel every time. We accepted what it was. We just chatted and the teacher just carried on talking about the lesson that was going on."

A public open day was held in the tunnels in May to assess interest in the site. MGGS say the development of the planned visitor centre is still in 'the early stages' and is likely to include a replica of a 1940s classroom.

SOURCE: *BBC News Kent ,* 27 June 2022

NEWS – HEALTH AND SAFETY

Woman plunges into a geothermal sink hole in New Zealand

An elderly Australian woman has been seriously injured after she plunged into a 'geothermal sinkhole' in New Zealand while walking on a footpath.

The woman, from Perth, was walking with her husband to the Whakarewarewa Village in Rotorua on the North Island when the ground opened up beneath her. She collapsed, suffering serious injuries, before her husband was able to pull her out. The woman was rushed to hospital, where she is said to be in a critical condition. The husband suffered less serious injuries.

The hole is thought to be around two metres long, one metre wide and at least one metre deep.

SOURCE: *MailOnline,* 29 July 2022

Burkina Faso mine disaster – at least six miners dead

On 16 April eight miners got trapped hundreds of metres underground by flood waters in a Burkina Faso zinc mine. The mine (owned by Canadian firm Trevali and over 710m deep) is located in Perkoa about 60 miles west of the capital, Ouagadougou.

The area saw heavy thunderstorms that cut off electricity and communications, flooding the mine. However, the accident caused outrage in Burkina Faso, as rescue operations only got under way following protests and a sit-in at a government building at a nearby town five days after the floods.

On 18 May rescuers reached the first refuge chamber (at a depth of about 570m); unfortunately it was empty. There is a second refuge chamber containing water and food at the bottom of the mine, which is still under water at the time of writing.

After 39 days of searching, the bodies of four miners were found on 25 May and two more on the 29th. The search for the remaining two miners continues.

SOURCE: *Below*, journal of Shropshire Cave and Mine Society – News Reports, April and May 2022

Blast at Colombian coal mine kills thirteen miners

Thirteen miners were found dead and two others still missing following the explosion that ripped through the La Mestiza coal mine in Colombia's northeastern El Zulia municipality on 30 May.

The mining authority said the explosion was generated by methane and coal dust, whose flame and pressure fronts caused landslides and high concentrations of carbon monoxide.

Rescue workers are continuing the search for eleven miners, who are said to be trapped about 650 feet below ground at the La Mestiza mine. However, their efforts have been slowed because the rescue team has been inhaling carbon dioxide and methane gas.

La Mestiza mine

The La Mestiza mine was shut down in 2021 because of high level of gases and reopened on May 19, according to the National Mining Agency. Accidents in coal and gold mines are frequent in Colombia. So far in 2022, 45 emergencies have been registered, causing the death of more than 30 miners, according to official data.

SOURCE: *MailOnline,* June 2022

NEWS – MILITARY AND DEFENCE

Bull Sand Fort in the Humber Estuary to be sold by auction

A unique opportunity to own a former naval sea defence post out in the Humber Estuary has arisen with the sale of Bull Sand Fort.

The Grade 2-listed fort, constructed between 1915 and 1919, was armed during the Second World War and had sufficient accommodation for a garrison of 200 men. Now the property is described as "in need of refurbishment throughout" by agents Savills, who put it up for sale at auction with a guide price of £50,000 on July 19.

Decommissioned in 1956, work began on Bull Sand Fort following the outbreak of the First World War but it was not completed until after the conflict ended. Located in the Humber Estuary, about 1.8 miles from the end of Spurn Point to the northeast and three miles from the mainland to the southwest, the fort is reinforced with concrete and its seaward side is fitted out with 12in of armour, designed to withstand gunfire from heavy naval units.

During the Second World War it was armed, besides the usual small and rapid-fire weapons, by two six-inch guns and two six-pounder guns. Bull Sand Fort, with its smaller companion fort on Haile Sand, 3.75km to the southwest, guarded the approaches to the Humber with gun batteries and an anti-submarine net of steel mesh stretched between them across the mouth of the estuary.

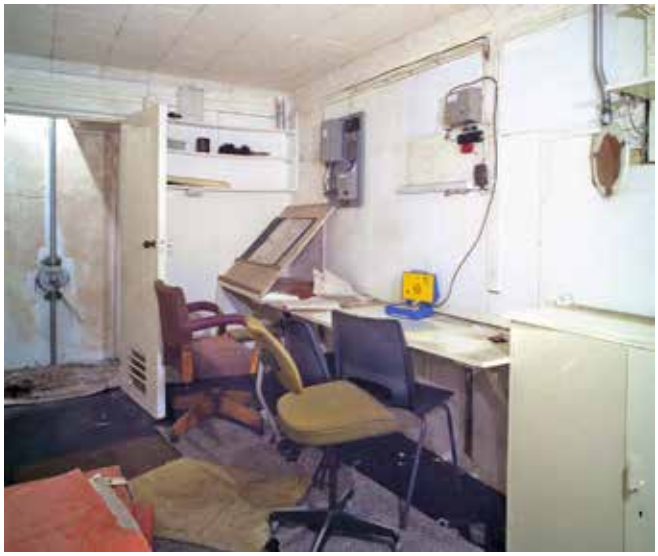
The fort includes three floors with a basement and a magazine below sea level, and a central two-storey observation tower. A fresh water supply is available at the fort via an artesian well. Externally there is a balcony and jetty and access is by "private boat only". The fort far exceeded its guide price, selling for £490,000.

SOURCE: *Grimsby Live,* 11 July 2022

Upton ROC post near Pontefract goes under the hammer

The Upton ROC post was offered for sale by auction on 21 July with a guide price of £18,000.

Set in the middle of a field is an ominous-looking feature which hides a hidden warren of rooms. The concrete structure is in fact the entrance to the former Royal Observation Corps bunker, with a metal ladder the only way to gain entry. The slice of recent history is now going under the hammer with a guide price of £18,000.



Upton ROC post. Photo Nick Catford

During the Cold War, the observation station was staffed by ROC volunteers whose job was to spot enemy aircraft flying over Britain. The station, according to estate agent Brown & Co, had no telephone but was linked to the UK Warning and Monitoring Organisation (UKWMO) headquarters and other UKWMO posts in the same "cluster".

ROC volunteers would unlock the surface hatch, open the trapdoor and descend six metres (20ft) into the subterranean chamber. The main chamber, measuring 4.55m by 2.24m and 2.13m, would house the volunteers, their instruments and welfare facilities.

The chamber, off New Road, Badsworth, near Pontefract, also contained a warning receiver to receive instructions on when to sound the hand-operated siren or fire the maroon, a warning rocket which produced a loud bang and a large flash. There was also a chemical toilet in an adjacent room, measuring 1.08m by 0.83m, but the loo has since been removed.

The agent described the bunker as "A former Cold War observation station once manned by the volunteers of the Royal Observation Corps. The site extends to 16m x 14m above ground with open countryside views and road access from New Road. The internal accommodation comprises a locked entrance hatch which leads to a 20ft vertical ladder down to an underground chamber measuring 4.55m x 2.24m x 2.13m high. This room would have housed the observers, their instruments and welfare

facilities. There is also a smaller room measuring 1.08m x 0.83m which would have housed a chemical toilet. Conditions were very primitive; there was no running water, gas or mains electric.

"The only communications with the outside world was the loudspeaker intercom device, connected to UKWMO Group HQ and the other posts within the cluster. There was no other means of two-way communication as there wasn't a telephone provided. The post had a Warning Receiver to receive instructions when to sound the hand-operated siren or maroon. The designated master post in each cluster had a radio for a backup to the landline intercom device."

SOURCE: *Hull Live* 22 May 2022 and Agent's sale particulars

Iran reveals underground drone bunker

Iran has revealed it has a massive underground military base brimming with missile-firing drones in a secret bunker beneath a mountain range. With concrete tunnels and military officials using buggies to get around, it looks like a James Bond supervillain's lair – and it has its very own array of deadly weapons to fit the bill.

The Iranian army gave some details, but not the exact location, of its secret underground base amid simmering tensions in the Gulf. State TV said 100 drones were being kept in the heart of the Zagros mountains, including Ababil-5, which it said were fitted with Qaem-9 missiles, an Iranian-made version of air-to-surface US Hellfire.

One reason Iran might be keeping the drones hidden is to prevent the country's enemies from destroying its huge fleet. "No doubt the drones of Islamic Republic of Iran's armed forces are the region's most powerful," army commander Major General Abdolrahim Mousavi said. "Our capability to upgrade drones is unstoppable."

An Iranian state TV correspondent said he was made to wear a blindfold on the 45-minute helicopter flight from Kermanshah in western Iran to a secret underground drone site. He was allowed to take blindfolds off only upon arrival at the base, he said. TV footage showed rows of drones fitted with missiles in a tunnel, which it said was several hundred metres underground.

SOURCE: *MailOnline,* 28 May 2022

Fort Borstal, Kent, goes on the market

A Victorian fort, which acted as an anti-aircraft battery in World War Two and has now been converted into a home, is on the market for £1.5 million.

Set within 50 acres of land, Fort Borstal features an extensive network of Napoleonic underground tunnels and a two-bedroom house. The five-sided citadel was built in 1875 by convict labour in a bid to hold the high ground southwest of Rochester, Kent. It was one of four forts that ringed nearby Chatham – home to the historic Royal Navy dockyard.

It became the base of an anti-aircraft battery in World War Two, shooting down German aircraft targeting the military docks. The current owners, who are looking to downsize after a labour of love spanning two decades, have used the unique layout and size of the subterranean network to create a number of spaces that have been used in various film and music video shoots in recent years.

After the conflict, the site was transformed into a pig farm and was used as a store for the nearby Young Offenders Institution. It was sold in 1991 to a company hoping to turn it into a museum but the project was never completed. Since then the site has been transformed into a residential property with no public access. But the historic Fort is back on the public market with estate agents Savills – and has received offers in excess of £1.5 million.

The fortress itself extends to approximately 8.3 acres, which includes The Guards' House – a two-bedroom property with the potential to be extended. At the front of the house is a small turfed garden and to the side are four former large water tanks – two of which have been converted to workshop space which could provide additional accommodation. Within the heart of the fort lies the Officers' and Sergeants' Mess which has undergone a recent refurbishment.

Partly built into the defences, the space comprises a wide entrance hall off which there is a kitchen and a drawing room, both with feature arched windows overlooking a courtyard. The property also has two bedrooms and a bathroom, the latter of which houses a recycled shower which started life on retired British ocean liner, *Queen Elizabeth 2*. On the first floor lies the main bedroom with steps up to the ramparts, which enjoy views over the

Medway Valley. And at the centre of the base are nine former casemates – fortified gun emplacements – which were once used as a lodge for the soldiers based there and now provide stables and storage space.

Baywatch star David Hasselhoff filmed his six-part mockumentary series *Hoff the Record* at the site in 2014. To add to the intrigue, the tunnels lead down to the old magazine chambers where the owners have created their own private bar and entertainment area.

Chris Spofforth, from Savills, said: "Without question, this is one of the most unusual sales I have been instructed on in my career. Not only does it have a wealth of history, Fort Borstal also presents an utterly unique opportunity to acquire a one-of-a-kind site that offers an exciting renovation or redevelopment project that brings with it an array of possible future uses. This spectacular and diverse property, the likes of which may not be seen again, is complemented by the viticulture, equestrian, natural capital and leisure potential of the sale, subject to the necessary consents."

SOURCE: *MailOnline,* 27 May 2022

WWII bunkers in Derbyshire to be demolished

Hidden away in the north Derbyshire countryside lie a series of bunkers dating back to the Second World War. Based at Harpur Hill, near Buxton, these bunkers have stored a variety of goods ranging from captured German V-rocket warheads to cheese and mushrooms.

However, two of these historic bunkers are to be demolished following planning approval being granted. Bunker 808 and Bunker 809 are the two lined up for demolition with both currently owned by the University of Sheffield. Concerns over health and safety have spurred the demolition plans. A planning document states: "The bunkers are in a state of disrepair and are no longer needed. Further deterioration could result in a health and safety risk. The removal of the bunkers is considered the most appropriate solution."

The demolition was approved on June 1 by High Peak Borough Council, stating the reason for approving the plans was that the proposal is "in the interests of public amenity." None of the consulted authorities had any objections to the demolition, however there was one public objection submitted to the council.

Kay Reid commented: "I am absolutely and utterly disgusted that the council would even accept an application to diminish this part of our history; this is recent history and should not be allowed to fall into disrepair. The University of Sheffield should be made to maintain this historic site and not allow this to fall into disrepair for their own benefit. If they are not able to maintain properly then pass it on to someone or persons who are able to. This area should be viewed with pride at what our ancestors fought for."

Originally operational from 1938, the Harpur Hill bunkers consist of 11 tunnels dug into the hillside, with

each tunnel stretching around half a mile. The RAF used the site to dispose of chemical weapons by burning them with bleach on the surrounding hills, creating toxic fumes which killed off much of the surrounding vegetation.

The RAF camp at Harpur Hill was heavily defended and even after the war, bombs continued to be stored at the site till 1961 when the base closed. The tunnels became a mushroom farm for ten years before being sold to a group of local people.

It was then used as a cold store for cheese and a warehouse was built for dry and bonded wines. The site is now operated by the Health and Safety Executive Laboratory, which has had a presence on the site since 1947, when it was the Safety in Mines Research Establishment.

SOURCE: *Derbyshire Live,* 4 June 2022

Buyer named for RAF Neatishead ROTOR site

While most millionaires spend their fortune on pricey cars and luxurious boats, William Sachiti used his fortune to purchase the Cold War era radar station at Neatishead, Norfolk. In 2010, it was advertised for sale with an asking price of $4,780,000 – Sachiti declined to say how much he paid for the location.

The Type 84 radar. Photo Nick Catford

Sachiti plans on bringing new life to the radar system, which was part of an early warning system meant to alert the British military if nuclear missiles were coming their way. Known as the AMES Type 84 radar, this one was in operation from 1962 through 1994 and released microwaves to detect incoming nuclear missiles. Sachiti does not plan on using it for its original purpose, but instead hopes the public can find a task more suitable for the modern world.

The buildings on the site include the two-level underground bunkers whose access is disguised inside an innocent looking bungalow. Of around 13 hectares of former base, 2.6 hectares have been retained by the Ministry of Defence – and the slimmed-down operation renamed a remote radar head. The air defence radar museum housed in the former WWII happidrome is also not included in the sale. The RAF hope it will continue as an attraction, but certain red tape needs to be cut through before that can happen.

The museum has become even more valued recently because it has opened a memorial room dedicated to the heritage of RAF Coltishall, which closed in 2006.

SOURCE: *MailOnline*, 5 July 2022

Cold War bunker revealed beneath Sunderland's Civic Centre but was it ever used?

During the Cold War practical steps were taken to combat the catastrophic potential. This included Sunderland, where a nuclear bunker was built beneath the Civic Centre. Sunderland Civic Centre was officially opened by Princess Margaret in 1970. Its brutalist design came courtesy of architect Basil Spence, who was also to blame for Coventry Cathedral.

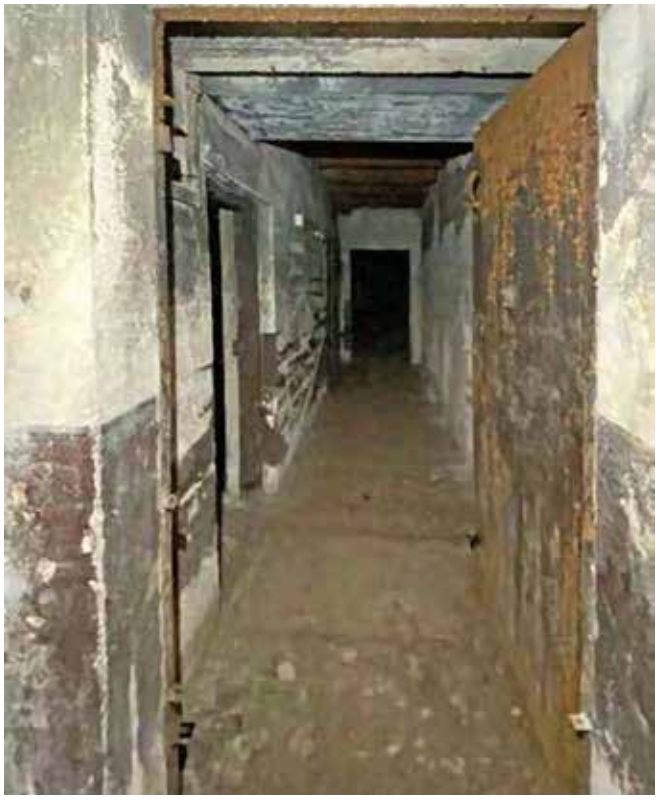
Its imminent demolition hasn't exactly been met with outraged despair. But its otherwise welcome demise is coupled with that of the bunker and an interesting piece of social history. There was a morbid yet understandable preoccupation with "the bomb" in the 1980s; paranoia fuelled by the news, television dramas like *Threads* and songs in the charts like *Two Tribes* and *99 Red Balloons*.

In the 1980s there was uncertainty in some quarters over the mere existence of the bunker. Even in the days before the internet there were plenty of what were known as urban myths, or outright lies as they were also known, so scepticism was reasonable.

A report requested by Sunderland City Council and published in January 2022 says: "Elaborate provision was made for ventilation and air filtration, and presumably also for communication, although none of the fittings survive in a state which merits preservation or, indeed, allows for the full explanation of its modus operandi." The report also says: "The origins of the Cold War Nuclear Bunker at Sunderland Civic Centre remain hazy, with any official contemporary documentation largely absent from the historical record."

Minutes from a Civil Defence Committee meeting at Sunderland Town Hall in 1963 confirm that a bunker would be as close as possible to the seat of local government. By 2022 the place was still in generally good repair, despite having been neglected for decades. According to the report, vandalism "has removed most of any fixtures and fittings which may have been present there until abandonment, which … appears to have been relatively soon after construction in the 1970s."

So it seems Sunderland's nuclear bunker, soon to be erased forever, was never even used for storage.



Spine corridor in the civic centre basement

The report concludes: "The recollections of former City Council employees may be of more interest in comprehending how the bunker was intended to be used, and in shedding light on the social and political context of the Cold War times in which it was intended to be used."

It is strange that Sunderland City Council know so little about this bunker as all the information is to be found in the Tyne & Wear archives! Prior to the construction of the Civic Centre, Sunderland Corporation had its control centre in a purpose-built Grade A surface blockhouse constructed in 1954 behind the Civil Defence HQ which was located in an old house in the southern suburbs of the city. This closed with the stand-down of Civil Defence in 1968. The house is still there but the bunker has been demolished.

When the Civic Centre was built in 1970 there was no money for Civil Defence; however in 1974 when Tyne and Wear County was formed they were offered the former regional war room at Kenton Bar as their County Main, but due to their left-leaning politics, this was refused. As they were required by law to provide some sort of facility, they opted instead for an ad hoc conversion of some basement rooms in the new Civic Centre with the County Standby located in a similar basement conversion at the South Shields town hall.

Similar facilities were provided at Cleveland with the County Main using the cellars of Middlesbrough town hall with the Standby in a communications room at Hartlepool civic centre. The council even demolished a 1954 bunker at Heaton for no reason other than to stop it being used.

SOURCE: *Sunderland Echo,* 21 June 2022

New use found for vandalised Staffordshire pillboxes

Several World War Two buildings which were created to defend us against possible German invasion are to be transformed after succumbing to vandalism. Five pillboxes, located along the River Trent between the National Memorial Arboretum, in Alrewas, and Walton Bridge, have already been converted into wildlife habitats.

Further conversions of pillboxes at Tucklesholme, between Walton and Barton under Needwood, and Branston Leas are in the pipeline, with plans to update or repair some of those converted by the Environment Agency more than a decade ago, some of which have been quite badly vandalised. The pillboxes are being transformed into somewhere for bats to hibernate in the winter, and swallow nesting sites, protecting these cultural heritage assets for the future, said a spokesman for the project.

It is part of a scheme by the Transforming the Trent Valley group, which is a partnership of 18 organisations working together to restore and enhance the natural and cultural heritage of the Trent Valley. The pillboxes were together designated as 'stop lines' and Stop Line Number 5 utilised the rivers Trent, Dove and Tame to prevent or slow down any advance from the German Army. The pillboxes were constructed of reinforced concrete, are hexagonal in shape, and have a loophole, one on each side, each loophole having angled sides to allow for maximum field of fire.

The pillboxes were never used. The German plan to invade Britain was cancelled and the invasion never came. In our Transforming the Trent Valley scheme area, most of these pillboxes have survived and, although they have no statutory protection, are surviving well, apart from the depredations of antisocial behaviour, vandalism and occasionally sinking a little into the river banks.

SOURCE: *Staffordshire Live*, 9 July 2022

NEWS – MINES AND MINING

Cavers find mineshaft frozen in time for 200 years

A pristine 200-year-old mineshaft that had been undisturbed since it was abandoned by miners during the Napoleonic wars has been discovered by cavers in Cheshire, revealing an almost unique "time capsule" of their underground life.

The cobalt mine, at Alderley Edge, was sealed by the miners when the shaft was abandoned, at a date that can be pinpointed fairly accurately thanks to one man who used candle soot to write his initials "WS" and the date 20 August 1810 on the rock wall.

The resulting lack of oxygen in the two centuries since means the mine is in an exceptional state of preservation, according to the National Trust, which owns the land. While the items left behind are humble – clay pipes, a leather shoe, a small bowl – the context in which they were found is "really very unusual", said Jamie Lund, an archaeologist with the Trust.

"This mine hasn't been disturbed by later mining, it's not been broken into by kids in the 1960s, and it's not been filled with bottles or other rubbish. It literally is a time capsule in terms of giving a glimpse into the environment that these miners, who were extracting cobalt, encountered."

Ed Coghlan and Jamie Lund, right, inspect one of the timber props installed by the miners. Photo: Paul Harris/National Trust Images

Blobs of clay putty stuck to the walls to hold the men's candles still show their fingerprints, while one wall bears an imprint of corduroy where a miner leaned against it. Wooden support struts and a windlass still wound with a hemp rope are remarkably well preserved.

Intriguingly, the small bowl had been deliberately placed on the floor with a rock wall built around it, leading to one interpretation that superstitious miners might have put it there to show gratitude for a rich seam of the material, which was prized for adding colour to blue and white pottery.

However, Lund said, " it pays always to be sceptical when anybody says that an object might have ritual or good luck connotations." He continued: "The explanation that appeals to me is slightly more jokey," suggesting that it might have been walled up by the miners to tease one of their number who always brought his breakfast down the mine. No one will ever know, however. "At the end of the day, it's a bowl. That much we are sure of," Lund said. Similarly, efforts to identify WS have so far been fruitless, after wage records were lost in a fire.

Alderley Edge, a dramatic escarpment that overlooks the Cheshire landscape, has been mined for copper, lead and cobalt since the Bronze Age. The mine in

question, which extends 10 metres (33ft) underground, was discovered in autumn 2021 when a dip was spotted in the landscape, suggesting a collapsing shaft seal. Members of Derbyshire Caving Club, who manage the subterranean spaces in the landscape on behalf of the Trust, were the first to explore and make it safe before archaeologists entered.

Unusually for such a rare find, it will not be studied for much longer, said Lund. "We quickly agreed that the real significance of this site is the fact that it has that pristine nature of an environment that the miners might have left yesterday," he said. As a result, it will shortly be sealed again with the artefacts inside, the oxygen allowed to run out "and the policy will be to stay out."

Happily, however, a detailed 3D scan has been made of the mine, which can be navigated interactively. "That's the benefit of living and working in the 21st century," said Lund. "It feels like we timed this discovery really well."

SOURCE: *The Guardian,* 12 July 2022

Editor's note: The mines at Alderley Edge were visited during the Sub Brit Manchester weekend in 2011; see *Subterranea* 28, December 2011, page 25.

Extinction Rebellion targets Welsh coal mine

Hundreds of demonstrators from Extinction Rebellion have 'occupied' the Aberpergwm colliery in South Wales to protest a shaft extension. Eco-warriors with red smoke bombs and black flags marched in white hazmat suits as they tried to stop the extension, which they claim would lead to 100 million tons more CO2. Eco zealots climbed on buildings and chained themselves to the gates of the mine while police looked on.

The group said the new shaft would break the Welsh government's Wellbeing of Future Generations Act. It asked First Minister Mark Drakeford as well as climate change minister Julie James to express 'clear and urgent opposition' to the Coal Authority.

SOURCE: *MailOnline,* 10 July 2022

Underground golf launched at the Llechwedd slate quarry in Wales

Outdoor activity giant Zip World has launched a new activity at its Llechwedd site in North Wales. The adventure company behind the world's fastest zipline has broken yet another record and developed the world's first cavern-style underground adventure golf course.

The new attraction opened on July 27 and Underground Golf is estimated to create 10 jobs in the area. A total of eight businesses and 13 contractors helped Zip World's in-house team to develop the new attraction. With more than 535,000 visitors visiting their sites each year, the introduction of Underground Golf represents the evolution of North Wales's new tourism offering.

Underground Golf is set 500ft below ground in a disused mining cavern and is only accessible by Europe's steepest cable railway. Bright neon lights will guide players through the cave across the 18-hole course, with each hole

offering a new challenge and showcasing a distinctive theme of slate mining.

The attraction welcomes adults and children aged three and older, and operates on a variable pricing ticketing system, ensuring people can enjoy something they've never experienced before. Other activities on offer at Zip World's Llechwedd slate caverns site include an exhilarating four-person zip line, an enormous underground bouncy net playground, a daring high ropes obstacle course and an interesting deep mine tour.

SOURCE: *North Wales Chronicle,* 27 July 2020

Editor's note: An extensive article about the Llechwedd mine appeared in *Subterranea* 59, April 2022.

Welsh gold panning fine

Brian Wright, from Oxfordshire, was fined £600 and ordered to pay £2,400 costs at Llandudno Magistrates' Court on 26 May after being found guilty of three offences of digging up or removing gravel, sands or minerals at Afon Wen, and operating a metal detector on land belonging to Natural Resources Wales.

He was found with a jar of gold dust near Dolgellau, Gwynedd, which he had collected on his trip last August. Wright, of Henley-on-Thames, denied the offences. Prosecutors told the court that a sign in the Coed y Brenin Forest at Afon Wen, near Dolgellau, Gwynedd, had outlined panning for gold was banned but that Wright was filmed carrying out the activity.

However, he said: "'It's my belief that sign is incorrect. I believe I know how the regulations should be interpreted." The "Dolgellau gold-belt" is said to stretch almost to Trawsfynydd from Cardigan Bay and includes gold mines such as Clogau and Gwynfynydd.

SOURCE: BBC News Report, May 2022

Great Laxey (Isle of Man) wheel repairs almost completed

Work on the iconic Isle of Man landmark began in January and was due to be completed by the end of May. Manx National Heritage have commissioned the repairs to the historic wheel, which although "complex" should safeguard the structure for the next 60 years.

When contractors Auldyn Construction examined the wheel in detail it was found that some timbers that looked fine on the outside were actually rotten on the inside. The recent phase of repairs entailed replacing rotten timbers and repainting the Wheel.

The 168-year-old wheel, which is 72ft in diameter, last turned in September 2020. It was built in 1854 to pump water from the Laxey Mines via flat rods that run on rollers up the valley before an angle bob takes the pump rods down the shaft.

SOURCE: *Below*, journal of the Shropshire Cave and Mine Society – Summer 2022

Has Shropshire earthquake disturbed local mines?

On Monday 30 May a 3.8 magnitude tremor was recorded by the British Geological Survey (BGS) in Shropshire – and felt by many residents. The tremor began shortly after 15:30 BST, with the epicentre just south of Market Drayton between the villages of Stanton upon Hine Heath, Weston-under-Redcastle and Hodnet (although many news reports said it was under Wem), at a depth of 5 miles.

A number of geological faults cross the region, including the Clive Fault. Clive Copper mine is developed along this fault; hence the slickensides that are clearly visible as you walk through the mine. It would be interesting to see if anything has changed underground at Clive in the near future.

The BGS say an earthquake of this magnitude only tends to happen once every three years in the UK. The last 3.8 magnitude earthquake was near Grimsby in northeast Lincolnshire, on 9 June 2018. Dudley was hit by a 4.7 magnitude in 2002.

In 1996, a 3.4 magnitude quake was recorded less than l0km away from the latest earthquake. Six years earlier in 1990, a 5.1 magnitude earthquake hit Bishop's Castle. At the time there was some concem that this might cause problems in Snailbeach mine, but it didn't seem to.

SOURCE: *Below,* journal of the Shropshire Cave and Mine Society – Summer 2022

Film about Thai cave rescue on release in selected UK cinemas

Ron Howard's biographical film about the 2018 Thai cave rescue mission has reportedly received the "highest test scores in MGM history". The film, titled *Thirteen Lives*, is based on the real-life story of the Tham Luang cave rescue mission in Thailand, after a junior football team and their coach were trapped for 18 days, and goes on release on 4 August.

Colin Farrell as John Volanthen, Joel Edgerton as Richard 'Harry' Harris and Viggo Mortensen as Rick Stanton. Photo Vince Valitutti

Viggo Mortensen plays a heroic firefighter in the new movie. Retired firefighter Rick Stanton was one of five cavers who rescued 12 boys of the Wild Boars football team and their coach from the Tham Luang cave in northern Thailand in June 2018. The boys, aged 11 to 16, had gone into the cave after football practice and got trapped by flood water. They survived for 18 days on an elevated rock two-and-a-half miles from the cave mouth, with hardly any food but sustained by meditation led by the 25-year-old coach, Ekapol Chanthawong, a former monk.

One of the Thai Navy Seal divers had already drowned in the flooded caverns while trying to take oxygen canisters through the narrow tunnels to the trapped group when Stanton had a crazy but brilliant idea. He realised that because the boys had no experience of cave diving, they would need to be unconscious as they were carried through miles of narrow, twisting and claustrophobic tunnels filled with water. So he summoned his Australian friend and colleague Richard "Harry" Harris (played in the film by Joel Edgerton), who is not only a cave diver but also an anaesthetist, to join the rescue operation.

Stanton asked Harris to sedate the boys with tranquillisers before they were extracted, one by one, each accompanied by an expert cave diver on their journey of more than five hours through murky waters in constricted tunnels back to safety. Every 30 minutes or so during the risky return journey, each boy was to be dosed with ketamine to keep them sedated.

SOURCE: *The Guardian,* 22 July 2022

NEWS – MISCELLANEOUS

Derbyshire firms builds UK's latest nuclear bunker

A Derbyshire construction firm has completed work on the UK's newest nuclear bunker but if you were thinking it's to survive a nuclear apocalypse then you need to think again. This bunker has been built to advance nuclear medicine and our understanding of how materials function in outer space.

GF Tomlinson, which is based in Little Eaton, has designed the project at the University of Birmingham. Now complete, the bunker is expected to house the UK's first High Flux Accelerator-Driven Neutron Facility. The new bunker, located on the University's Edgbaston Campus, forms part of the School of Physics and Astronomy.

The contractor worked closely with concrete specialists Northfield Construction and M&E engineers Dodd Group to erect a steel frame followed by a concrete structure. The project also called for a bank of land to be excavated down to around 24 feet at one end.

Specialist radiation doors also had to be installed along with an 18-inch thick floor, two-ft walls and a one-ft thick floor slab on top. G F Tomlinson also put in a gantry crane and roller shutter to enable the installation of the High-Flux Accelerator, which has now been lifted into place. The contractor is due to return later this year to install a wall in place of the shutter, sealing the highly specialised equipment safely into its final location which is due to be fully operational by summer this year.

The facility will be the first of its kind in the UK, and only the second such facility in the world – the other is located in Helsinki in Finland. It forms part of the National Nuclear User Facility (NNUF), which is funded by the Department for Business, Energy, and Industrial Strategy (BEIS).

SOURCE: *Derbyshire Live,* 3 May 2022

Fire in popular Sub Brit watering hole

A Central London pub has been left with its windows completely smashed after a huge fire erupted from the basement. Around 150 people were evacuated and three people were treated by paramedics at the scene after the blaze broke out at the *Admiralty* pub in Trafalgar Square on 12 July.

Huge plumes of smoke and bright orange flames burst from the building as terrified witnesses stood to watch the dramatic scenes. London Fire Brigade said there were 20 fire engines, and 125 firefighters tackling the fire as 'half the basement' was alight, warning people to avoid the area. An eyewitness who works nearby witnessed the fire unfold and said the smoke was so bad the whole of Trafalgar Square was full of it.

The following morning, the pub remained cordoned off by police until the building was cool enough for firefighters to head in to investigate the cause of the fire. Pictures show the glass windows completely smashed with a blackened interior.

SOURCE: *My London,* 13 July 2022

Editor's Note: *The Admiralty* has been an occasional destination for members of our 'Sub Pub' group who like to spend a convivial evening sampling real ale in London's best pub basement bars.

Mystery of locked green door in Cornish hedge is solved

Some people do not notice the mysterious green metal door set in a stone wall covered in ivy as they walk past on the footpath. However, those that do cannot help but wonder what secrets lie behind it.

In early July, the security gate was unbolted, the padlock was taken off, and the door was opened for viewings of what is being described as an 'intriguing opportunity' as the hidden property goes up for auction.

Opening onto a raised pavement on Alverton Road in Penzance, the locked door, by itself, in a hedge with no obvious building behind it, has puzzled many passers-

by over the years. Searching for answers on social media several years ago, a curious resident was offered suggestions that the door led to a 'secret garden', a 'nuclear bunker', or a 'portal to the underworld'.

In reality the mystery underground structure was somewhat less interesting. Behind the locked green door is the former Greenbank Water Pumping Station – a booster station to raise and maintain the water pressure from Drift Reservoir to the centre of Penzance. It was sold off by South West Water to a private buyer in 2013.

Inside the small room, which is set below the entrance and measures around 6m x 5m, the disused pumps and machinery are still in place, but have clearly not been used for over a decade.

SOURCE: *Cornwall Live,* 26 June 2022

TfL develops new method of cooling its tube lines

The famously hot parts of the London Underground could become a lot more pleasant if a new way of cooling the tube proves to work, and the money is found to install it in tube stations.

When the tube tunnels were first dug they were so cold that the fact that the tube offered a respite from the hot sun was a selling feature in early adverts. However, over the past century, the cool clay that surrounds the tube tunnels has absorbed so much heat that it can't soak up any more, and with nowhere for the heat to go, the tube trains have become uncomfortably hot to travel in.

Transport for London has been looking for a way of removing the heat for decades, and with such a large and varied network there was never going to be a one-size-fits-all solution, and now TfL has a new idea to try out. A trial project to cool the tube has been set up at Green Park station.

The Green Park trial worked in that it cools, but it turns out that the large fan units installed above the platforms are less than ideal for use in a live tube station. The main problem is dirt; the tube tunnels are filled with dust and particulates being blown around, and those clog up the fans and ducts used in the cooling units. That means a lot more maintenance than is ideal, and being in a live train tunnel, it's a lot more work to safely climb up to the fan units to clean them when the station is closed. What was needed is a way of delivering lots of cooling with minimal fanning.

Cooling system installed in the Aldwych platform at Holborn station. Photo Ian Mansfield

About five years ago, TfL senior engineer Tony Ridley was asked to think about how to solve this problem, and after some thinking and computer design work came up with an idea that was interesting enough to secure some internal innovation funding.

What's been created is a curved metal panel unit that can hang from the ceiling of a tube station with a series of aluminium rectangular tubes running through them. The large spaces in the rectangular ducts are for air to be pumped through, and the air is cooled by a supply of cold water that runs in pipes built into the structure.

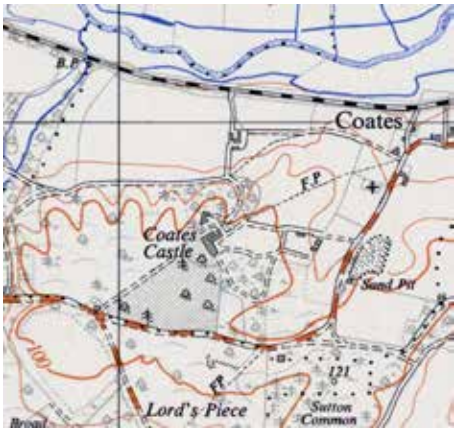
A key innovation is that running the cold water in parallel to the airflow reduces dirt build-up inside the units. A small-scale model was initially built and now a prototype has been installed in the disused Aldwych platform at Holborn where it is now under test.

SOURCE: *Ian Visits* website, July 2022

Underground room near Petworth, Sussex investigated

Sub Brit was contacted by a member of the public about an 'unusual bunker' just south of the village of Coates, near Petworth, West Sussex. The structure is about 20 metres east of Coates Lane on the edge of a sand pit.

The room is empty apart from two metal bins. Photo Neil Iosson



The underground room is 20 yards southeast of the Coates Sand Pit and 20 yards east of the road

The building is on top of an earth bank/rising ground. It is a fairly basic concrete slab with two vents protruding out of it. There is a narrow set of stairs (deep in dead

leaves) descending on one side with a 90-degree turn into a chamber about 2.5m x 3m. The concrete roof is supported by a mix of metal bar and (rotten) wood. There are two simple vents in the ceiling.

The walls are basic brick with white paint. There are no windows/embrasures and no other exits. The room is mostly empty but the most interesting object is a built area with two metal bins and a single (very rusty) steel lid.

The building doesn't appear to be military and is more likely to have been industrial and may well have something to do with the adjacent sand pit. The sand pit dates from the 1950s – it is not shown on an OS map dated June 1948 but is shown in June 1958.

SOURCE: Neil Iosson, July 2022

Editor's note: There is discussion on the Forum about this 'bunker'.

Plans for underground bunker in Warrington could be agreed

A futuristic underground car garage being debated by councillors is owned by a dot com multi-millionaire. Duncan Cameron, the co-founder of *Money Supermarket*, is behind the scheme for the garage to store his private collection of vehicles.

Despite the land being described as green belt, Warrington Borough Council has recommended the facility can be built as it will increase biodiversity in the area as ponds, grasses and ditches will also be added.

Site of the proposed bunker

The circular-shaped building would stretch 48 metres in diameter and house 68 vehicles, some underground, while some will be visible above ground. It would be accessed by a 92m long ramp which would extend to the hard standing of the former runway at Stretton Airfield used during the Second World War but which is now partially the M56.

This is the scaled-down version of a previously approved application in 2018 which also included a house. The scheme would also include a landscaping plan to this segment of the airfield, which would involve the planting of native grasslands, hedgerows and trees, the formation of ditches and a pond.

Appleton Parish Council has objected to the plans on the basis it is inappropriate in the green belt, while four letters from nearby residents objected with fears over traffic, the possibility of events being staged there in future and further development among their concerns.

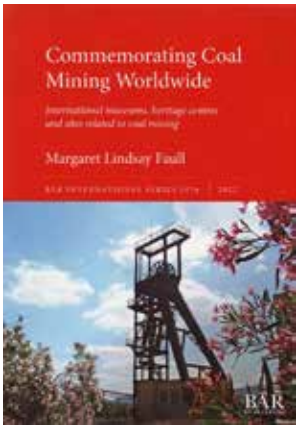
SOURCE: *Warrington Guardian* 20 July 2022

NEWS – PUBLICATIONS & BOOK REVIEWS

Commemorating Coal Mining Worldwide

FAULL, Margaret Lindsay, 2022, BAR Publishing, 504pp, £115 ISBN 9781-407358-12-3

Book Review by Martin Dixon



Until her retirement in 2015, Margaret Faull was Director of the National Coal Mining Museum for England at Caphouse. But she has been kept busy in retirement and recently completed this epic work recording 432 museums, monuments and memorials to coal mining worldwide.

The entries are sorted alphabetically by country – 48 in all – from Australia to Vietnam. Germany has the highest number of entries, followed by the UK. Zambia and Zimbabwe both happen to have coal mines too but obviously they're not commemorated within these countries.

In the preface Sir Neil Cossons (first Director of the Ironbridge Gorge Museum Trust and Chair of English Heritage from 2000 to 2007) comments that the author has "brought her unique knowledge and understanding to bear on a subject of global significance", a sentiment with which I wholeheartedly agree. For this volume is far more than a list of locations but is an expert summary of the mining history and heritage of each country, bringing out areas of difference as well as commonality.

Prior to the main part of the book there is a useful introduction which covers (at quite a pace) a general history of coal mining and topics like geology, engineering, transport, surface features, disasters, the TU movement, architecture and art. The vast majority of the text is then given over to the detailed descriptions of the various sites that commemorate coal mining in each country.

Vocabulary familiar to UK mining has been used throughout, so in the USA we have pit head baths instead of wash houses, while the evocative French term *salle des pendus* (literally 'room of things hanging') has been replaced by the more prosaic 'changing rooms'.

The coverage is impressive and must have taken countless hours of research – no doubt facilitated by the author's role as Honorary President of the Network of European Coal Mining Museums. The information has

been extended and expanded by national organisations and societies and use of the internet (especially for sites outside Europe).

The names of all the sites are helpfully recorded both in the local language and translated to English. Most of us could probably find sites close to home but for further afield would have to rely on sometimes out-of-date Tripadvisor reports.

Although extensive, the coverage concentrates on sites largely or wholly dedicated to actual mining so there is no entry (for example) for the Science Museum in London which has much material of interest. There are inevitably some omissions – one I noted was the possibly unique war memorial at the former Couriot coal mine near Saint-Etienne which features statues of both a miner and a soldier in tribute to the efforts of both during World War I.

Perhaps to compensate, the Tunnellers' Memorial at Givenchy-lès-la-Bassée is featured which commemorates the only tunneller to be awarded the Victoria Cross in World War I; the recipient William Hackett was a coal miner in Mexborough before he joined 254 Tunnelling Company.

There are over 450 photographs throughout the book – an average of around one a page. These illustrations cover a wide variety of topics and scenes, both above and below ground, the vast majority covering the period of preservation rather than operation. There are a few anomalies, for example Barnsley Main headgear appears in the middle of the section on Japan.

The entry for Huskar Pit, in Yorkshire, where 26 children aged between 7 and 17 were drowned in 1838, does not include a photo of the on-site memorial but is instead illustrated with a photo of the *Eros* statue in London's Piccadilly Circus (which commemorates the Earl of Shaftesbury who introduced the Mines and Collieries Act of 1942 forbidding females from working underground).

Some of the photos are somewhat disappointing; perhaps inevitable for those period shots of the time of extraction. Some current photographs however seem to have poor balance or contrast and the shadows on surface features can be distracting. With so many sources of photographs this is understandable but it feels too many have been reproduced without adjustment. The comparatively matt paper used may also have contributed to the variable quality of reproduction.

In a volume of this nature an index is not missed and the contents list each featured site. There is however a concordance – a listing of all the sites which feature a stated characteristic such as headgear or actual underground access. There is also a bibliography, but I would have preferred this to have been subdivided by main theme or geography, rather than a single alphabetic sort by author.

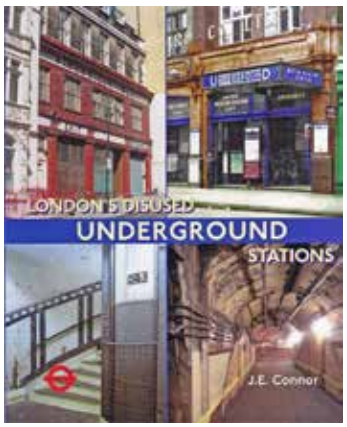
There are no maps which is a pity as something showing the worldwide coal measures and their relative production at peak would have been interesting, as would maps of some of the key countries.

Overall this is a fascinating book which can be read from cover to cover as well as used for reference . For the price, however I would have expected a hardback production. £115 will be out of reach of many Sub Brit members but I'd encourage readers – especially those who live in a former coal-mining area – to ask their local library service to acquire a copy or two.

London's Disused Underground Stations

CONNOR, J E, 2021, Capital Transport, 128pp, £19.95
ISBN: 9781-85414-467-6

Book Review by Martin Dixon



Interest in London's disused underground stations has never been higher. Many are now accessible through the London Transport Museum's *Hidden London* tours. These visits come at a price however – Aldwych being £44 and Down Street £85 – although this does include a ticket to the LT Museum.

For those stations which remain off-limits, the recent second series on the Yesterday TV channel *Secrets of the London Underground* with presenters Tim Dunn and Siddy Holloway has continued to open up some of the network's fascinating hidden spaces.

For many years, the definitive published work on the capital's abandoned stations was *Abandoned Stations on London's Underground* by Jim Connor. This was published in 2000 and although fascinating, some of the photos were a little disappointing. This new volume is largely rewritten, is longer, and uses a wider range of images. Many of the photos are from the London Transport Museum, with whom the publication is associated. Our own Nick Catford has also supplied around forty of his own images, excellent as ever.

In terms of the scope of the book, the word *Underground* is used for those stations which were part of London Underground or its predecessors, so not all of the stations were actually underground. The scope is also limited to those stations within Greater London, and so excludes Buckinghamshire and Essex. Complete relocation of a station is also within scope but changes that only involved the movement of platforms (for example at Hounslow West) are not.

There are 26 stations featured, each taking a chapter and listed in order of closure – from King William Street in 1900 to Shoreditch in 2006. The length of the chapters varies quite a lot and essentially depends on the information and illustrations available.

Many of the stations include details of secondary uses before or after closure such as Aldwych's reuse as an air-raid shelter and British Museum store in World War II. There are a few omissions however and the entry for Charing Cross could have usefully mentioned (and illustrated) its use as a filming location.

The photographs include many of the stations in use as well as the empty buildings and passageways after closure. I found the earlier photos much more interesting, as they often include period advertising, signage and period dress.

The range of station signs – pre and post roundel – is particularly fascinating. There are also plans for many of the sites, again from the London Transport Museum archives. An artist's impression of the surface buildings at the never opened (or even built) North End Station (usually known as *Bull and Bush* after the famous nearby pub) is also included.

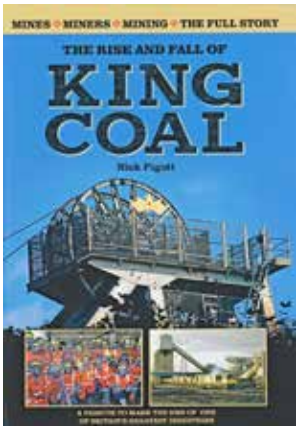
There is no index but given the structure of the book this is no great loss. What would have been helpful however, particularly for those less familiar with the metropolis, is a map showing the location of all the stations featured. Some of the period maps from when the stations were operational would also have been a nice touch.

Overall however, the presentation of the book is a great improvement on its predecessor and the Capital Transport production is its usual crisp self. Definitely recommended for all London Underground enthusiasts, and at a fraction of the cost of a visit to the few sites that are open to public tour.

The Rise and Fall of King Coal

PIGOTT, Nick, 2022, Gresley Books, 256pp, £29.99
ISBN: 9781-911658-63-4

Book Review by Martin Dixon



In the last edition of *Subterranea,* a book chronicling the history of UK coal mining was reviewed. *Black Gold*, by Jeremy Paxman, took a relatively scholarly approach, focusing in particular on the social and political aspects of the industry. The current volume covers exactly the same brief but the result is a much broader and more accessible publication; the contents are more of a celebration than a critique.

Nick Pigott, a former journalist and editor of *Railway Magazine*, originally published a shorter 'bookazine' version of the text in 2016 but this version is hardback and almost twice the length. He has done a superb job in telling the story of Britain's coal industry in an accessible, but not dumbed-down, style.

Chapters cover history, technology, industrial relations, growth and shrinkage and eventual closure. The closing chapters also discuss preserved collieries in the UK, especially those where underground access is possible, and energy policy.

There is an unusual use of appendices to cover particular aspects of coal mining, including why so many collieries have 'Main' in the title, pithead baths, Forest of Dean 'free' miners and pit ponies. The last in particular resonated as my grandfather looked after pit ponies between the two world wars and my mother talked fondly of the ponies playing in the fields as they too had their holiday during Barnsley's 'Feast ' week.

The text is supported by almost 300 photos and diagrams, around sixty of them of underground scenes. The plans showing the location of major coalfields and geological sections are particularly useful, as are the photos of posters, signage and banners. The book is indexed and has a useful glossary. Subterranea Britannica is included on the list of organisations which might be of interest to readers.

Photos showing the hardship of coal extraction, the last shift on a mine's closure, and the demolition of surface infrastructure post-closure are particularly poignant. But the book is not without humour and as well as the pithy title, one of the (official) safety notices photographed reads: **WARNING In case of Nuclear Attack please hide under the litter bins, nothing ever hits them.**

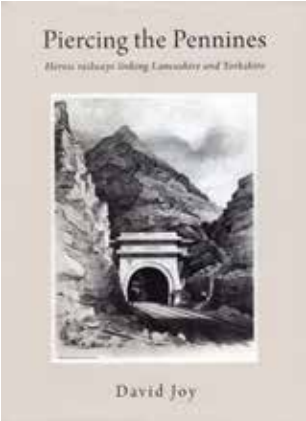
Some of chapters feel a little short, for example those on drift and open-cast mining. These could perhaps have been extended at the expense of what sometimes feels like an over-emphasis on rail transport above and below ground, including in the photographs. But this is perhaps understandable given the author's background and all in all, these are miner (pun intended) quibbles. At almost £30 the book is not cheap but does provide a comprehensive record of the coal industry from 1800 to the present day.

Overall this is a superb record of the industry's challenges, toils and achievements above and below ground which catalysed so much social and industrial change.

Piercing the Pennines: Heroic railways linking Lancashire and Yorkshire

JOY, David, 2021, Great Northern Books, 127pp, £19.99
ISBN: 9781-914227-02-8

Book Review by Martin Dixon



Providing good communication links between the economic centres of the north of England (today's Northern Powerhouse) is a current transport initiative, unofficially dubbed HS3. But the demand for cheap and efficient links across the Pennines goes back 250 years. This volume focuses on the construction of the key railway lines between Lancashire and Yorkshire, and especially their tunnels, that were developed by rival companies.

The need for the east-west links was to provide for the efficient movement of both raw materials and finished products to and from the factories and mills, especially cotton in Lancashire and wool in Yorkshire. Plus, of course, the transportation of coal to domestic and industrial premises.

Great Northern Books in general, and David Joy in particular, normally focus their books on Yorkshire alone and David is pleasantly self-deprecating in his acknowledgement that much of the drive for the trans-Pennine railways came from Manchester.

The initial chapter gives a summary of earlier canals that crossed from Yorkshire to Lancashire and some details of early tunnels elsewhere on the railway network. Important though this scene setting is, the author has perhaps tried to cram too much into this introduction. A couple of statistics quoted give some feel as to the scale of a major tunnel: Box Tunnel on the Great Western Railway allegedly consumed a ton of candles and a ton of explosives every week. Perhaps partially as a result of their close proximity, the tunnel also cost the lives of over one hundred of its workforce.

The bulk of the book is given over to separate chapters describing the railway tunnels that eventually did "pierce the Pennines". The first was Summit Tunnel (Manchester and Leeds Railway), opened in 1841. This was followed in the same decade by the first Woodhead Tunnel (Sheffield, Ashton and Manchester Railway, 1845) and subsequently by Standedge Tunnel (Huddersfield and Manchester Railway but part of the LNWR by completion in 1849). Additional parallel bores were to follow at Woodhead (1852) and Standedge (1871 and 1894).

The last new line to construct trans-Pennine tunnels was the southernmost – the Midland Railway's Totley and Cowburn tunnels which opened together in 1894. Totley is the longest of the featured tunnels at 3 miles 950 yards (5.69km). A final project was Woodhead 3, a twin-track tunnel with room for overhead electric traction that opened in 1954. This replaced the two single-bore tunnels but was itself short-lived; I recall using it in its final month before closure to passenger traffic in 1970. One final postscript describes the rail crash inside Summit tunnel in December 1984 when petrol tankers caught fire after the derailment of a freight train within.

The treatment of each enterprise is wide-ranging – covering aspects that range from the geology and engineering, the construction period and the attendant tragedies through to the years of operation. The whole is supported by 120 illustrations (a third of them in colour), many of them period photos which help bring the pages to life. The book as a whole is very crisply produced and well indexed and has a short bibliography.

The main routes described are shown in a well-drafted map but a few more plans could have usefully included the earlier canal tunnels and the layout of the more complex structures (eg the four tunnels that run through at Standedge). At the end of the day, it was of course the promoters and above all the navvies who were the 'Heroes' of the subtitle; this volume is thoroughly recommended as a record of tunnel construction before TBMs, H&S and HS2.

NEWS – TUNNELS AND TUNNELLING

Nottingham home with its own 'cave' goes on the market

A charming mansion with its own underground cellar of 'enchanting' caves has gone on the market for offers above £1.75million. The five-bedroom property on the leafy Park Estate in Nottingham also boasts gardens with statues and 3,100 sq ft of floor space.

According to its listing, the house comes with planning permission to build a massive 7,000 sq ft contemporary home on top of the 19th-century caves. The column caves were designed by Alderman Thomas Herbert, a wealthy lace manufacturer, between 1850 and 1876. They were originally designed to house Herbert's remarkable

collection of full-sized statues of gods, druidical figures and even Christ.

SOURCE: *MailOnline,* 18 July 2022

New design of vent shaft for HS2 tunnels

Images have been revealed showing updated designs for one of five shafts that will serve one of the tunnels on the HS2 high-speed rail network.

The Amersham vent shaft head house in Buckinghamshire will provide ventilation and emergency access to the 10 mile-long Chiltern tunnel. It will be in the middle of a road junction just outside the town.

The single-storey vent will be in the middle of a road junction just outside the town (artist's impression)

The new design has reduced the height of the circular single-storey building by more than two metres. HS2 said its design has also been altered to help match the natural tones of the surrounding landscape, and the weathered steel boundary wall has been replaced by a more traditional wall made of flint. The Amersham head house is one of the few parts of the Chiltern tunnel visible above ground so it's important that HS2 gets the design right.

The Chiltern tunnel is the longest on the HS2 project, which is designed to improve links between London, Birmingham and the north. Below ground level, the 38-metre deep Amersham ventilation shaft will reach down to the twin tunnels below, with fans and other equipment designed to regulate air quality and temperature, remove smoke in the event of a fire and provide access for the emergency services.

SOURCE: *BBC News,* 6 July 2022

Finland leads the way for disposing of spent nuclear fuel underground

Nearly half a kilometre underground, in the Precambrian bedrock of Olkiluoto, an island off the southwestern coast of Finland, a rough-hewn gallery a few metres wide and similarly high runs dead-straight through the granite.

Underfoot, the floor is a bit muddy, though mostly rocky. Overhead, steel meshing stops any fragments that might have been loosened by the drilling falling onto people's heads. Neither hard-hat-mounted torches nor the headlights of an electric van can reach far enough into the Stygian darkness to pick out the gallery's end, some 350 metres away in the distance.

Within a few years, this gallery, part of the Onkalo spent nuclear fuel repository, should be a resting place for batches of waste from Finland's two nuclear power stations, to be sealed off permanently from the world. It was completed in June, the last of five almost identical tunnels that run parallel to each other, connected by a main access gallery. If all goes well, a warren of roughly 100 more will be excavated as needed over the coming century.

As new galleries open, old ones will be backfilled with clay and sealed with concrete, entombing their radioactive contents. Deep geological disposal of this sort is widely held to be the safest way to deal with the more than 260,000 tonnes of spent nuclear fuel which has accumulated in 33 countries since the first nuclear-power plants began churning out electricity in the mid-1950s, and the still larger tonnage that may be generated in the future.

At the moment, the vast majority of spent fuel is kept underwater in cooling pools, often within or near the power plants that generated it. The rest is in dry store. Wet or dry, these facilities are all intended as temporary depots while companies and governments wrestle with the headache of where to put the stuff permanently.

SOURCE: *The Economis*t, 22 June 2022

Another smugglers' tunnel linking San Diego with Tijuana (Mexico) found

A major drug smuggling tunnel has been found by US authorities running from Mexico to a warehouse in an industrial area in San Diego. The secret passage from Tijuana to San Diego featured rail and ventilation systems, electricity and reinforced walls, authorities said.

It measures 1,744 feet in length and is 61 feet deep and was discovered near San Diego's Otay Mesa border crossing in an area where more than a dozen other sophisticated tunnels have been found in the last two decades. Agents were conducting surveillance on a 'known drug stash house' in National City, south of downtown San Diego.

U.S. authorities said it was unknown how long the tunnel had been operating and what amount of drugs, if any, got through undetected. They seized 1,762 pounds of cocaine, 165 pounds of meth and 3.5 pounds of heroin in connection with the investigation. Six people, aged 31 to 55, were charged with conspiring to distribute cocaine.

All are Southern California residents and have pleaded not guilty.

The tunnel is in one of the most fortified stretches of the border, illustrating the limitations of border walls. While considered effective against small, crudely built tunnels called 'gopher holes,' walls are no match for more sophisticated passages that run deeper underground. The latest passage discovered on Friday ran one-third of a mile to Tijuana. It was four feet in diameter and about six stories deep.

The type of drugs seized may signal a shift from the multi-ton loads of marijuana that were often found in discoveries before California legalized pot for recreational use in 2019. Hard drugs, such as heroin, methamphetamine and fentanyl, are typically smuggled through official border crossings from Mexico because their small size and lack of odour make them difficult to detect. But tunnels give smugglers an advantage of being able to carry huge loads at lightning speed.

The tunnel exited the United States in a nondescript warehouse named Amistad Park on a street that is busy with large semi-trailers during the day but quiet at night. Before the raid, armed guards watched over a small shaft with a ladder that descended into the tunnel.

They followed two suspects who left the house in a vehicle and drove to the warehouse. Upon searching the warehouse, agents uncovered a sophisticated border tunnel exit point carved out on cement floor. The tunnel is the 91st in the Tijuana–San Diego area and the 272nd tunnel found along the entire border since 1993.

Authorities have found about 15 sophisticated tunnels on California's border with Mexico since 2006. The largest was a huge 4,309-foot tunnel in Tijuana that was discovered by federal agents in January 2020. The tunnel was equipped with air ventilation, electricity, a rail cart system and an elevator. Many tunnels are in San Diego's Otay Mesa industrial area, where clay-like soil is conducive to digging and warehouses provide cover. By federal law, U.S. authorities must fill the U.S. side of tunnels with concrete after they are discovered.

SOURCE: *MailOnline,* 17 May 2022

Fire in Gibraltar tunnels

The Royal Gibraltar Police are investigation the cause of a major fire that broke out in the Powers Drive tunnel in Gibraltar around midday on 26 July. The emergency response has been non-stop since then, with the GFRS supported by the Royal Gibraltar Police and other agencies, alongside utilities operators AquaGib and GibElec.

The tunnel fire continued to burn on Thursday afternoon but by then under control, the Gibraltar Fire and Rescue Service said, as it released dramatic images of the horrific conditions that firefighters faced inside. Photos and video showed how parts of Powers Drive Tunnel had collapsed, at times narrowly missing firefighters working in intense heat and near-zero visibility.

Firefighters managed to extinguish the fire in Vault 3 of the tunnel on Wednesday but items stored in the adjacent Vault 4 remained alight. Firefighters had overnight been tackling Vault 4 directly but were forced to pull back because of safety concerns.

There is no confirmation as yet as to how the fire started and police said it was too soon to comment while the GFRS was still tackling the blaze. The was no confirmation either as to what exactly was alight, although it is believed the fire in Vault 4 may be centred on rubber tiling used to protect the ground for large stadium events such as the music festival, and which was being stored there.

Protecting the integrity of the nearby reverse osmosis water plant has been a top priority since day one, and now it has emerged that a collapse in the tunnel has damaged pipes and cables. The plant itself has not been operational since Tuesday because power was cut, with the Gibraltar government implementing water restrictions to ensure supply to the community and essential services.

Even after the fire is extinguished it may take some days to make the area safe – and there is no guarantee as to when that will be, given the "incredibly unpredictable" nature of the blaze.

SOURCE: *Gibraltar Chronicle,* 28 July 2022

Tram tunnel proposed for Kent

Plans have been unveiled for a new £800 million 'sustainable' tram network connecting Kent to Essex which avoids the congested Dartford Crossing with a mile-long tunnel under the River Thames. The KenEx project, led by Thames Gateway Tramlink, proposes a new electronically-powered tram network linking the two counties by 2030.

The tram network is estimated to wipe ten percent of traffic off roads in the area, while it would cost just a

fraction of proposals for the multi-billion pound Lower Thames Crossing. Trams would run initially between Purfleet-on-Thames and Grays in Essex to Ebbsfleet and Gravesend in Kent, with the majority of the track above ground. But at the heart of the project is an immersive tunnel that would be built into the Thames riverbed using pre-cast sections.

The project, which is said to have the backing of local council leaders, aims to create a 'sustainable public transport infrastructure' and an 'integrated and enhanced local economy never enjoyed before by communities either side of the Thames'.

The tunnel would be constructed by utilising 'existing cutting-edge light rail technology' to construct the tunnel, drawing upon immersed tunnel technology

In Essex, meanwhile, the majority of potential stations are to the east of Grays. Tilbury, Chadwell St Mary and Southfields. Stanford Le Hope, DP World London Gateway, Thames Enterprise Park, Canvey Island, Corringham, Basildon Hospital and Basildon are all 'under evaluation' to see if they will form part of the network.

The Dartford Tunnel opened in 1963 to provide crossing facilities before the Queen Elizabeth II bridge was constructed to provide additional capacity from 1991. However, the M25 and local roads still become backlogged with traffic and local residents have long called for more to be done to tackle the issue.

A consultation is currently ongoing over the Lower Thames Crossing which, if approved, would become Britain's longest road tunnel. It is designed to almost double road capacity across the Thames to the east of London, connecting disparate communities, reducing delays and providing more reliable journeys.

A number of slip roads would also be redesigned to improve safety at junctions and make the project more visually appealing, while one lane southbound between the M25 and A13 junction would be removed to reduce the amount of land required.

SOURCE: *MailOnline,* 19 May 2022

Refurbishment of Thames Water Victorian water mains

An extensive programme of refurbishment work is being carried out by Thames Water to lengthen the useful life of cast-iron water mains, many of which are over a hundred years old. Access to underground water mains is generally effected by sinking shrifts, usually in a public road. The photograph shows one of the shafts in North London which Thames Water have been using to gain access to water mains.

The photograph shows the end of a 36-inch diameter pipe which people may have had to enter to carry out essential work inside the main.

SOURCE GLIAS Newsletter 321 August 2022

Elizabeth Line joy-riders on track for fun

More than a third of trips on the new Elizabeth line were made by passengers for fun, a survey suggests. Nearly a quarter of Londoners have used the £19 billion railway since it opened two months ago, according to a YouGov poll.

Of this group, some 37 percent said they took a special trip out of their way to see what it was like. People aged 25-49 are most likely to have used the line (28 percent), followed by those aged 18-24 (25 percent), 65 and above (20 percent) and 50-64 (17 percent). Hundreds of transport enthusiasts travelled on the first trains when the line opened on May 24.

The route stretches from Reading in Berkshire and Heathrow Airport in west London to Abbey Wood in southeast London and Shenfield in Essex. It runs via new tunnels between Paddington in west London and Abbey Wood. Around 22 million journeys have been made across the line according to TfL, including more than 11 million in the new central tunnels.

Andy Lord, chief operating officer at TfL, said: "Huge numbers of people have come to see our fantastic new railway, using it to travel across London to see friends and loved ones, commute to work and visit the many sights and attractions the city has to offer. More than 11 million journeys have been made between Paddington and Abbey Wood – that's more than 200,000 daily journeys. We are already receiving great feedback from our customers who have been impressed by the new stations and direct journeys they can make."

Crossrail was hit by construction issues and complications installing signalling systems. It was due to be completed

Crowds lined up outside Paddington Station to ride the first trains on London's new Elizabeth line

in December 2018 and ran £5 billion over its original £14.8 billion budget, with the government making up the shortfall. The YouGov survey of 1,306 adults in London was conducted from July 15–22.

SOURCE: *Daily Telegraph*, 30 July 2022

The Light Fantastic

Musician Tom Kitching lives aboard the unconverted narrowboat *Spey*, built in 1937 by Fellows, Morton and Clayton. When passing through the Maida Vale tunnel on London's Regent's Canal, he noticed the setting sun shining straight through the southwestern portal of the tunnel.

Such a phenomenon is usually associated with sunrise on the Box railway tunnel on Brunel's birthday, so it's surprising that this remarkable effect had not been previously recorded. Luckily Tom had camera to hand and took a stunning image. His experience and photo are reproduced below, courtesy of *Waterways World* magazine.

Spey's subterranean sunset

On January 27th, boater and musician Tom Kitching was cruising through Maida Hill Tunnel in Little Venice when he caught this extraordinary moment behind him. The winter sun was shining directly into the 260-yard tunnel, lighting it up almost entirely south-to-north.

There's a long-running legend that Brunel aligned Box Hill Tunnel, on his Great Western Railway, so that on his birthday the sunrise shone directly through the 2-mile structure near Bath. Recent experiments confirmed the theory as 'nearly right', although a more likely date is that of his sister's birthday.

Did the Regent's Canal's mastermind, John Nash, have the same idea for Maida Hill Tunnel, some 20 years earlier than Brunel? Tom Kitching checked the dates and said: "Interestingly we tried to tie this phenomenon to Nash's birthday, and found it was out by about nine days. Until we realised he was born under the Julian calendar, which might account for the difference!"

Tom's boat, *Spey*, was involved in the recent HVO fuel test (News, *WW* February), when he cruised from the Bridgewater Canal to London on a single tank. It's a historic Thomas Clayton 'gas boat' with an old Bolinder engine, and he found huge benefits to the new fuel.

Tom is now spending the winter in London, writing a blog, Where There's Brass (*buskengland.wordpress.com*), that he will use as the basis of a book, and preparing an album of music and soundscapes to accompany it, much as he did with his earlier projects (*tomkitching.co.uk*).

We would be interested to find other canal tunnels where this phenomenon might occur. There's a guide to locating sunrises and sunsets at *diamondgeezer.blogspot.com/2018/03/solar-azimuth.html*.

Sub Brit Maginot Line Tour: Fortitude with Promptitude

Martin Dixon

On top of Combat Block 1 at Fermont Gros Ouvrage, showing how little of the massive structure is exposed above ground. From the left are a retractable turret for twin 75mm guns, an air intake and a fixed machine gun cupola

After a gap of over two years, 6 May 2022 marked a welcome return to overseas trips for Sub Brit. Given the uncertainties of the timescale and manner of the lifting of Covid restrictions, the Committee decided to use a third party to deliver the weekend, leaving them responsible for making (and potentially unmaking) the site and accommodation arrangements.

And so it was that 38 members joined a private Leger Holidays tour to the Maginot Line, with guide David Warren and driver Ian for five days of visits and socialising. The invasion of France in May 1940 through to the Dunkirk evacuation less than a month later is David's speciality and the Maginot Line helped determine both the location and the success of the German campaign.

After an early start and an on-time journey through the Channel Tunnel we had time on our side and we were delighted to make a slight diversion and add a visit to the V3 'Supergun' site at Mimoyecques to our itinerary. The site has featured on previous Sub Brit visits and I won't describe the site here as it was ably covered most recently by Vince Stenhouse in issue 46 of *Subterranea* in December 2017.

Our tour guide David describing the armour plating designed to sit on top of the V3 Supergun at Mimoyecques. This example was found quite recently in the Boulonnais Marble Quarry, about 5km to the south of Mimoyecques

Unloading platform in the rail tunnel that runs right through the V3 site at Mimoyecques

Welcome to Belgium

A three-hour drive saw us arrive at our overnight hotel in Liège. David Warren's advice was a mixture of practicality and enigma, and I quote:

* "Boil the water in the kettle twice as 'certain nationalities' wash their socks in it."
* "Don't breakfast too early to avoid mixing with the industrials."
* "Above all, promptitude should be the order of the day."

After a splendid buffet meal we renewed old friendships and made new ones over some thirst-quenching Belgian beer.

Saturday 7 May

Our first advertised site of the following day was Fort Eben-Emael, a reminder of how building for yesterday's weapons and tactics can easily backfire. The fort was built between 1932 and 1935 and was one of the largest fortifications in Europe. In addition to its formidable firepower (17 turrets and casemates, including seven artillery positions), the fort was protected by the Albert Canal on one side and by defensive ditches elsewhere.

However, the successful German attack at dawn on 10 May 1940 came not by land but by air. Ten gliders landed on the grassed roof of the fort and 78 crack troops proceeded to disable the fort's armament and turrets through the use of shaped explosive charges. The attack was the first occasion that both airborne assault and shaped charges were used in warfare and the special troops involved had trained for months for the specifics of the raid. German excellence in glider-flying was an unintended consequence of the 1919 Treaty of Versailles, whose terms expressly forbade powered flight. Gliding was even a demonstration sport at the 1936 Berlin Olympics.

Inside Fort Eben-Emael

Walking up from the car park we passed a Belgian Gate, also known as a Cointet Element. These were heavy steel barriers weighing around 1.3 tonnes which were named after their inventor Léon-Edmond de Cointet de Fillain. The barriers were used to form an anti-tank barrier across Belgium. After defeating the country, Germany used these barriers elsewhere, including as beach obstacles on the Atlantic Wall.

Sideways-sliding drawbridge that protects the entrance to Fort Eben-Emael

We were then met by our guides Hugo and Arnaud who led us into the fort over a drawbridge and past a decontamination suite, anticipating the use of poison gas that never materialised. A board commemorated those of the defenders who died in the war – many of them in later years when operating as resistance fighters. Entering the tunnel system which extends to over 5km of galleries, our tour included technical equipment (generators and air-handling) and accommodation blocks for Officers, NCOs and Other Ranks. Kitchens and Infirmary were also on display. Postwar, the fort remained in military hands so the equipment was well preserved, although items of furniture are authentic replacements.

A short video gave an overview of the short battle for the fort. A well-fortified citadel which was designed to support up to 1,200 men for four weeks fell in 36 hours.

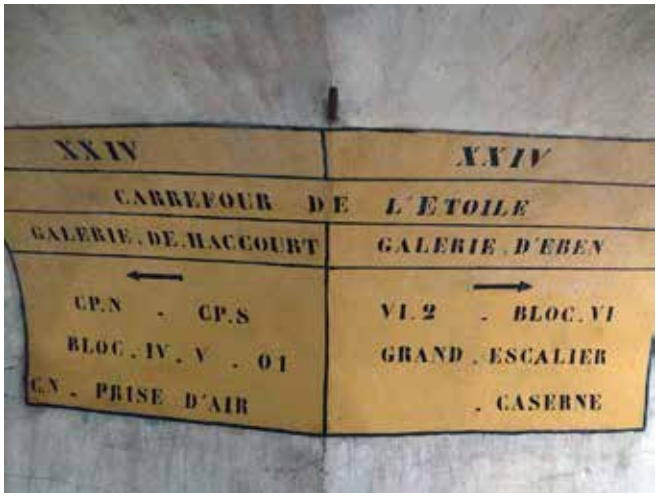
Beds and equipment for NCOs within Fort Eben-Emael

The threat of the approaching gliders was not recognised and so they were able to land with little opposition. Some commentators state that the Germans held plans of the complex but this seems unlikely as they also attacked dummy cupolas which had no armaments or even access from the fort. The method of attack using shaped charges and airborne special forces was considered so secret that the surrendering garrison was initially housed in separate prisoner-of-war camps to minimise the chances of the techniques used getting out.

Visé number 2 Casemate

After an initial staircase that led to an intermediate level (where most of the galleries are located) we were surprised to follow a gently descending passage. The explanation is that the shafts from the surface were excavated to a level of 25 metres and so the passages within effectively mirror the surface contours. Ascending up a second staircase of a mere 100 steps, we arrived in Casemate Visé number 2 – one of four casemates supporting three 75mm guns each. Two were south-facing and named after the town of Visé and two faced north to Maastricht which lies over the Netherlands border. Protocol demanded that permission of the Dutch Forces was needed before firing across the border.

Junction within Fort Eben-Emael, showing the length of the passageway through a damaged blast door



Original signage at a junction in the main galleries beneath Fort Eben-Emael. The point is labelled 'Star Junction' and as well as Combat Blocks, the Barracks, Air Intake and Main Staircase are all indicated. Photo Martin Dixon

One of the three 75mm guns within combat block Visé number 2

Magazines for the guns had entrances that were offset to the entrance to the stairs to minimise blast propagation. Ammunition was lifted to casemate level using a counterbalanced 'paternoster' lift (no longer functioning). The gun positions relied on firing commands being issued from Fire Controllers in the Battle Command centre, themselves informed by observers in separate cupolas. Used shells fell down a chute to the lower level of the casemate into fireproof vaults.

The bottom of the access stairs had the provision to be blocked off with steel bars and sand should the upper level be breached and we next visited the bottom level

The blast doors at the base of the shaft leading up to a combat block. On the left can be seen the steel bars and sand that would be used to secure the entrance should the casemate above be breached.

of Maastricht number 1 casemate which had been breached and blocked in this way. After the conquest of the fort, the command was given for the remaining shaped charges to be destroyed to prevent regular German forces being made aware of their existence. One enterprising German used a charge at the bottom of the stairwell and the resulting blast destroyed the whole of the stairway and lift shaft, buckling the heavy blast doors in the process.

Damage at the foot of the access shaft to combat block Maastricht number 1, caused by an explosive charge being placed here. The author and Linda provide scale and show their delight on the restarting of Sub Brit trips. Photo Richard Doran

On our exit, we passed the fuselage of one of the attack gliders, model DFS-230. Within the tiny fuselage, nine troops sat on a narrow bench, with legs to each side. The gliders were towed from near Cologne by Junkers 52 aircraft and the undercarriage used for take-off was ditched after take-off, the landing being achieved on skids, with parachute braking. Rather than getting out in turn (the approved method) we were told the troops often cut themselves out to expedite egress. The example of the glider at the fort is unique and reconstructed from three original gliders.

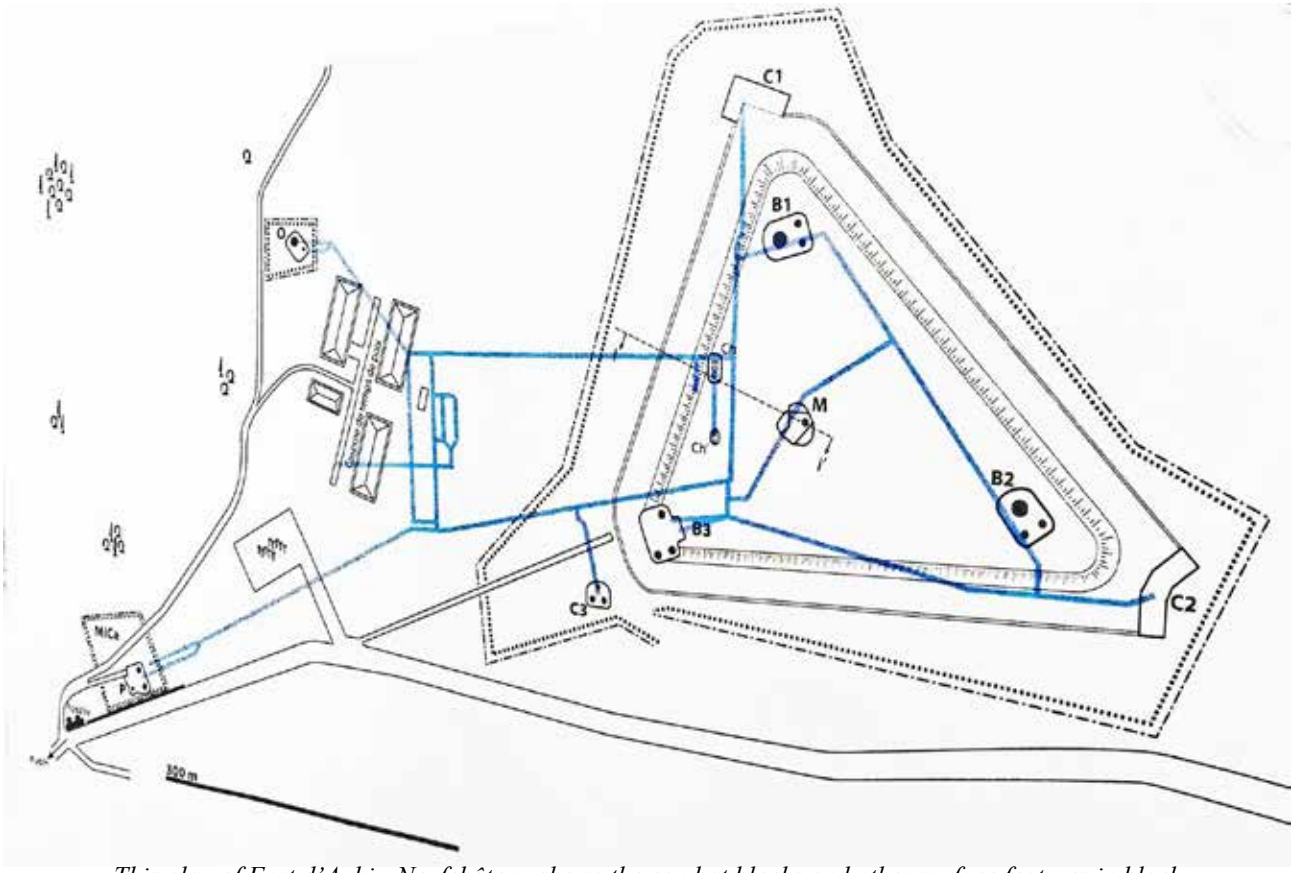
Front section of the reconstructed glider of the type that attacked and silenced Fort Eben-Emael

Fort d'Aubin-Neufchâteau

Our visit to the scene of one of the most intriguing and decisive battles of World War II complete, we drove to the nearby, but smaller, contemporary Fort d'Aubin-Neufchâteau. This sister fort to Eben-Emael was constructed between 1934 and 1939 to defend Liège to the east. Before our visit David had arranged for us to eat our packed lunches in the cafe/bar on site. The lunch was apparently designed by IKEA and consisted of six slices of bread, packs of butter and slices of cheese and ham. Luckily self-assembly was straightforward and no Allen key was required.

Our visit, guided by Philippe, one of the volunteer group, started with an uphill trail to Block 3, giving the defenders an advantage against any assault. This block alone is estimated to weigh around 4,000 tonnes and was equipped with machine gun turrets, a 47mm anti-tank gun and searchlight position. The roof of the block was 3.5 metres of solid but reinforced concrete. The gates across the entrance track still bear extensive damage from defensive machine gun fire and the entrance block shows the scars from incoming shells. We entered over a rolling drawbridge, passing a decontamination suite. The air on this level was not filtered, that being reserved only for the barracks area (*Caserne*) below.

Now within the fort we descended around 30 metres to the main circulation level down an impressive single flight staircase. We were able to look up the vast lift shaft which would originally have lowered ammunition and supplies from the entrance above. We learnt that the fort had been surrounded by German forces on 10 May



This plan of Fort d'Aubin-Neufchâteau shows the combat blocks and other surface features in black with the connecting deep-level passages in blue. The main entrance is to the far left.

The entrance gates at Fort d'Aubin-Neufchâteau show extensive damage from machine gun bullets; in this case from defensive shots fired from within the fort

but held out until 21May, after 18,000 shells and mortars had been fired from within. The final surrender only took place after the fort's ammunition was exhausted. Later in the war the Germans used the fort for weapons testing, of which more later.

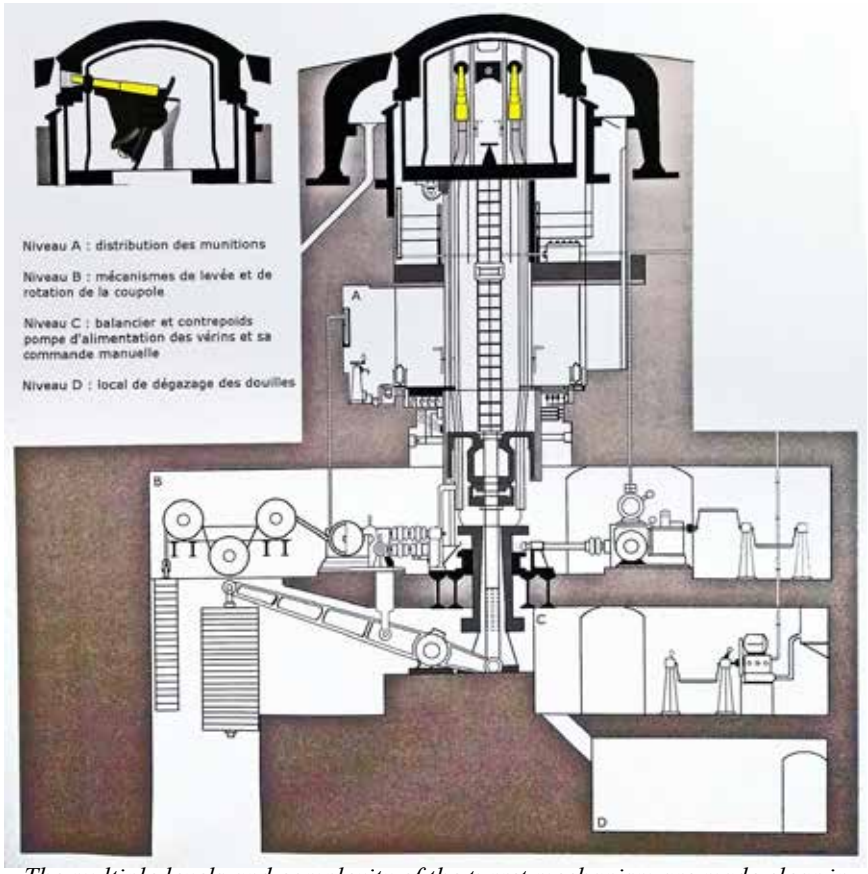
Damage caused during German action to Block 3 indicates the ferocity of the attack in May 1940

Off the Beaten Track

Our tour took us through the majority of the underground galleries, encompassing technical and ammunition areas as well as the barracks. As we were a special group with the right experience and equipment we went well off the normal tourist trail, into destroyed areas with a myriad of trip and fall hazards. Barriers and protective grilles were removed for us to improve photography. Sadly our French hosts on future days were less willing to allow us off-piste.

These guidelines are painted in the former telephone exchange at Fort d'Aubin-Neufchâteau. The translation is pretty obvious and would no doubt have served as a reminder to telephone operators

Fresh air came from two separate ventilation intakes, the base of both of which we were able to visit. The water supply was from a deep well, still holding water and showing some evidence of minor flow. Although most equipment had been removed we could see the base of the mortar turret and site of the ammunition lift into the turret. The mortar positions were generally targeted into valleys where direct artillery would not find a direct line of fire. The filtration system for the barracks area was duplicated so one half of a mirrored arrangement could be used whilst the other was been cleaned or serviced.


Niveau A : distribution des munitions
Niveau B : mécanismes de levée et de rotation de la coupole
Niveau C : balancier et contrepoids pompe d'alimentation des vérins et sa commande manuelle
Niveau D : local de dégazage des douilles
A
B
C
D

The multiple levels and complexity of the turret mechanism are made clear in this cross-section. The turret could be raised electrically or by manual power due to its counterweight balancing.

Within the barracks area in particular, one unexpected but delightful aspect was the amount of painted and decorated walls that remained. The infirmary, officers' quarters and kitchen areas for example all had vibrant remains of what gave the appearance of wallpaper, with stencilling and marbling effects being used to make the surroundings more homely. The quarters should have been quite warm too as the surplus heat from the generators was used in a localised central heating system.

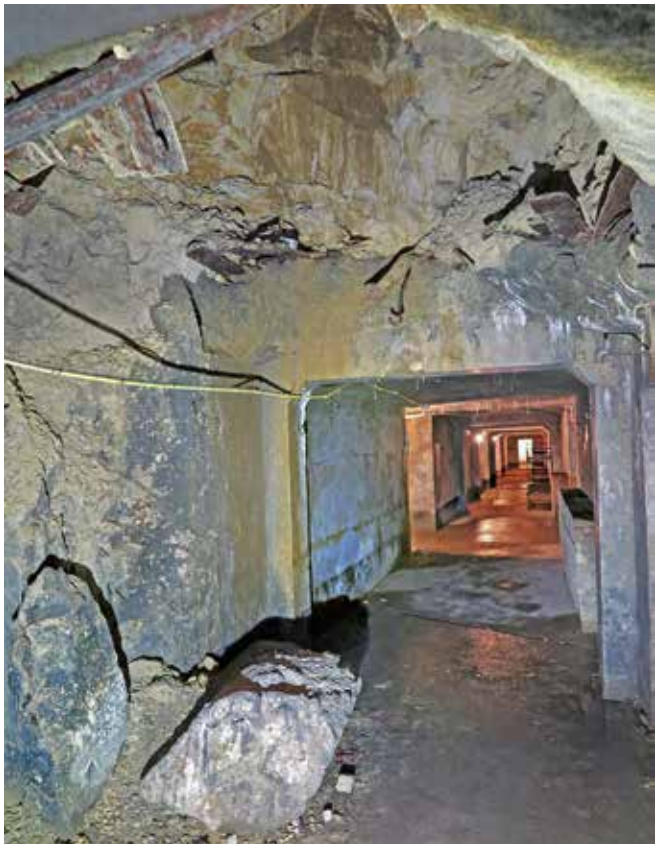
One of the unexpected delights of Fort d'Aubin-Neufchâteau was the number of rooms, mainly in the barracks, painted to resemble wallpaper. Photo Linda Dixon

Röchling shells

One intriguing sight was a result of experimental use of Röchling shells tested at the fort in 1942–43 during the period of German occupation. The Röchling shell was a high-density shell developed by German engineer August Cönders. These were designed to be fired to a high trajectory and to reach the target in a near-vertical high-speed impact. Although intended to pierce both concrete and armour plate, they only proved effective against the former.

All around the barracks area we saw the evidence of their testing – usually in the form of a destroyed roof to the room or corridor in question. In the natural rock exposed by the impact of some of the shells we could see a long narrow bore which marked the arrival route, through a thickness of bedrock around 30m deep. In one instance, a shell had continued to penetrate the corridor floor and the shell was still embedded just below floor level. A measure of this example showed it to be 15cm in diameter with some hollowing to the rear of the projectile.

Our visit ended with an ascent to what would have been the emergency exit block, which doubled as one of the air-entrance shafts. Right by the exit was a



Damage to the roof of the gallery within Fort d'Aubin-Neufchâteau caused by experimental use of Röchling shells

A Röchling shell embedded in the floor at Fort d'Aubin-Neufchâteau, having penetrated around 30 metres of bedrock before passing through the ceiling of the gallery and then destroying the floor.

small niche which we were told would have held a small statue of St Barbara – the patron saint of artillerymen (and miners). We completed the fascinating visit with a look round the recently opened surface museum which displays artefacts linked to a chronological journey through events surrounding the site. These include another original Röchling shell recovered from the fort.

A three-hour drive then took us through Luxembourg and back into France to our hotel on the outskirts of Thionville – our base for the next three nights. En route we passed the town of Bastogne, scene of the final German counterattack in December 1944 in the so-called

This niche by the entrance to Fort d'Aubin-Neufchâteau would have held a statue of St Barbara. Photo Martin Dixon

Battle of the Bulge. The Ibis hotel where we stayed had comfortable rooms and a good (continental) breakfast but the evening meals were decidedly concocted by an accountant rather than a chef.

Sunday 8 May – VE Day

Sunday 8 May marked VE Day (*Fête de la Victoire* in France) and it felt fitting to be visiting sites which were in action at the start of the conflict that ended 77 years ago. En route to the first site we took a slight diversion to drive around the site of the Bréhain Gros Ouvrage. The site used to have significant remains but these are under threat from redevelopment of the area (into what, isn't clear). The fort did not see any significant action in World War II but was part of the same sector as our destination for the morning – the Crusnes Fortified Sector, named after the river whose valley it loosely follows.

Around an hour from Thionville, we arrived at Gros Ouvrage Fermont and assembled for our tour. The site was initially surveyed by the Commission d'Organisation des Régions Fortifiées (CORF), the Maginot Line's design and construction agency, in early 1931 and was completed at a cost of 77 million francs.

There are seven fighting or combat blocks and plans for a second stage which would have added four more combat blocks which were never completed. [It's probably worth mentioning at this stage that I am no expert on ordnance and although I'll describe the main areas we visited, any reader requiring a detailed inventory of the firepower of each fort can easily find this online through wiki or one of the specialist Maginot sites.]

The Maginot Line

The Maginot Line was an immense defensive line of forts and other hard points that was constructed on the northeastern boundaries of France in the 1930s. The main line stretched for around 280 miles along the German border. Although it bears the name of the French Minister of War (André Maginot) who gained approval for the project, its main advocate and champion was his predecessor Paul Painlevé. Both Maginot and Painlevé died in the early 1930s – Maginot aged just 54 – and so never saw the project reach fruition.

The best known elements of the defensive line are the vast underground forts, completely self-sufficient for up to three months and with well-protected artillery positions. There were 45 large forts (gros ouvrages, literally large works) and 97 smaller ones (petits ouvrages). The largest forts were garrisoned by over a thousand troops and had everything from their own hospitals to wine cellars for the officers. Firepower ranged from small arms and machine guns (fusils-mitrailleur), through anti-tank guns, to significant artillery pieces of 50mm, 75mm, 81mm and 135mm. The heavier ammunition included grenades, shells, and mortars.

Firing positions were protected by casemates, cupolas or fully rotating retractable turrets. Armour plating of the turrets was typically 30cm or more and the concrete protection up to 3m in thickness. The concrete was usually laid in one continuous pour, to prevent planes of weakness being introduced.

However, the Maginot Line is not just a line of forts. It is a massive network of thousands of elements that supported the forts in the late 30s through to 1940, many of which still exist. This supporting infrastructure includes barracks, casemates, machine-gun posts, observation posts, anti-tank defences, minefields, areas to be flooded, ammunition and supply depots, narrow- and standard-gauge railways, and power and telephone networks.

The line was divided into 21 sectors, as part of the line of command, and our Sub Brit trip visited four of these. The best defended areas were on the border with Germany; the border with Belgium being only lightly defended. As well as Belgium being a French ally, the logic was that the Germans would be forced to invade through Belgium which would give the French time to mobilise their forces. Some of the Maginot casemates were pointing inland to target such a flanking movement but the rate of German progress after invasion and the collapse of the Belgian defences negated this plan.

If you want to see a stunning representation of the size of the entire Maginot Line, the website https://wikimaginot.eu/index.php#carto has a map showing over 13,000 individual structures.

We were told that in May 1940 Fermont fired against the German invasion and also provided covering fire for the French retreat. A month later Fermont fired on the neighbouring Petit Ouvrage Ferme Chappy and helped repel an assault on it. Fort Fermont was evacuated in line with the armistice of 25 June and saw no action in the 1944 retaking of the territory by the US Army (although it was used as a rest and recuperation shelter). The site was taken over by a local heritage association in 1975 and opened for public visits a couple of years later.

The ammunition entrance block to Fermont Gros Ouvrage, showing the extensive defensive embrasures and cupolas. The brackets two-thirds of the way up the wall held communications aerials

Into the Depths

The larger Maginot forts had two substantial entrances – one for the troops (EH: *Entrée des Hommes*) and the other for ammunition and other supplies (EM: *Entrée des Munitions*). We entered through the ammunition entrance which was well protected by two observation/light machine gun turrets, a grenade launcher and three machine gun embrasures (one with an interchangeable anti-tank gun).. Today the block is labelled as A2 FERMONT. There was a gated entrance and a retractable drawbridge; a curving passage meant that incoming fire could not penetrate the armoured door beyond.

We descended using the original 1930s ammunition lift, built to carry five tonnes so amply coping with a couple of dozen Sub Britters. We viewed the main magazine (M1) where incoming ammunition was transferred from wooden boxes into metal cages or stillages. Fuses were stored in a separate magazine to minimise the chances of unintended detonation.

Alongside the magazine was the terminus of a 60cm gauge railway that was laid to transport ammunition to the combat blocks. The railway operated on 600V DC via an overhead catenary and although the track extended into the magazine, traction here was achieved using cable haulage to reduce the chance of sparks igniting propellant. Exiting the magazine we assembled at a

Part of the Sub Brit group entering the original ammunition lift at Fermont. You can see that ammunition trucks could be run straight into the lift

The lower level of the ammunition lifts showing the emerging 60cm gauge railway tracks and pointwork

broader section of tunnel where the railway was double-tracked. This was the largest underground space in the complex and as well as acting as the train station was the place where mass briefings took place. It was also the location where entertainments and cinema for the troops took place, and where Sunday services were held.

We boarded a train parked at the station. The locomotive and trucks were both original but the seating a later addition on converted ammunition trucks. The overhead power line had been modified to a plastic enclosed pick-up to reduce the risks of an uninsulated live wire but was otherwise as built. The French refer to the Maginot trains as the Metro – a different sort of Maginot Line!

Former ammunition trucks now converted for passenger use about to leave the ammunition magazine 'station' at Fermont

Fighting Block 4

Like most Gros Ouvrages, both entrances to Fermont fort were some distance – over a kilometre in this case – from the fighting blocks and we set off towards the other end of the fort at a steady pace. The tunnel was lined with stone rather than concrete – it was felt that being 30 metres underground meant that no special reinforcement was necessary.

Around halfway, alongside a passing loop, we passed the marked original burial site of the only French casualty of the action in 1940. This was Florian Piton who died on watch on 21 June at the personnel entrance when a German 37mm anti-tank shell scored a direct hit on the slit of the observation cupola. He was buried a day later in a grave dug out of the wall of the main thoroughfare but later reburied on the surface at the request of his family.

On arrival at Block 4, we disembarked and at the same level was the forward store for ammunition which each block was equipped with. Transport from here to the guns themselves was via an overhead monorail system from which the stillages could be suspended. The track was equipped with points and the two lifts up to the combat block also had track to support two or three stillages. We were able to take the same lifts, in full working order, up to the gun level – those with more energy chose to walk up the stairs.

Each combat block had its own forward store of ammunition. Here both the railway and the overhead monorail systems can be seen

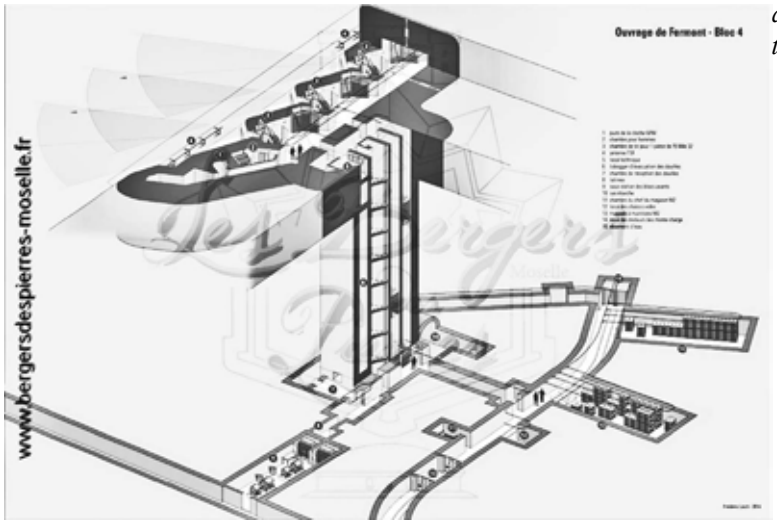
There were two levels to the artillery block – the lower floor held a 'ready store' of ammunition, fire-proof rooms for the empty shell cases and basic accommodation for on-duty troops. The floor above held three 75mm guns, with a range of up to 11km. After being shown the components of the weapons, including the fire control indicator, we were able to exit over the moat and view the exterior of the casemate.

One of the 75mm guns in Block 4 at Fermont, ammunition storage to the right. The central vertical structure is the chute down which shell cases would be sent. To its right is one of the dials used to receive orders from the fire control room

The moats that surround most blocks on Maginot forts are known as *fossés diamant* (literally diamond ditches or moats) and their naming follows on from their equivalent in Vauban-era forts, whose angular shape more closely resembled a diamond. As well as presenting a physical obstacle to attack, the ditch or moat also served to collect machine gun cartridges and prevented any spalling concrete after attack from blocking the embrasures. Most are protected by machine gun posts and hand grenade chutes.

The Fort from Above

The three 75mm guns made an impressive backdrop and the ideal spot for a group photo of the Sub Brit team.



Cross-section of Block 4 at Fermont. The separation of the weapons above from ammunition stores, power and other services below is very clear. Image: Les Bergers des Pierres - Moselle Association

As well as the three 75mm embrasures, Block 4 was also equipped with two fixed cupolas for local defence. One housed an observation/light machine gun (*GFM: Guetteur et Fusil-Mitrailleur* which translates as lookout and machine-gunner) and the second a pair of heavier machine guns (*JM: Jumelage de Mitrailleuses* or twin machine guns).

A short walk on the surface took us to the outside of Block 1; inside the fort this would have involved a descent and re-ascent of around 400 steps. Here was mounted a rotating retractable turret for two 75mm guns, plus a grenade-launching cupola and another light machine gun. The turret alone of the 75mm gun weighs around 30 tonnes and the whole rising and falling mechanism an estimated 265 tonnes.

Barracks, Kitchens and Technical Blocks

We retraced our steps to re-enter the fort and after descending took the train back to the barracks (*caserne*) area; a little way down from where the personnel entrance intercepts the ammunition passage. Here we saw the Officers' quarters and the much less luxurious dormitories for other ranks. The latter had three-tiered bunks where hot-bedding would have been employed.

Three-level bunks that would be occupied by Other Ranks at Fermont. Hot bedding would have been used as there was insufficient space for the entire garrison

In the catering area we passed the large kitchen; most of the meals would have been prepared in huge vats or *marmites* and then shipped out to the fighting blocks in insulated containers. Unless the fort was locked down, much of the cooking would have been done outside the fort. The train was used as transport and when on these duties became known as the soup train (or simply 'the soup'). Perhaps 'gravy train' might be a better translation.

Adjacent to the kitchens were numerous store cupboards for food stores including a wine cellar that was opened specially for us. French troops were entitled to half a litre of wine a day as part of their rations.

Cauldrons and oven within the main kitchen at Fermont

Banks of filters and air-circulation pump at Fermont

There were no separate dining areas for troops; instead these fold-down tables in passageways would have been used

In the technical areas (*usine*), we saw in a side-room a well 65m deep that could supply 10,000 litres per day. The French were conscious that Fort Vaux had to surrender in 1916 due to its water supply running out. We saw the generators and air-handling plant, situated near the personnel entrance, to make it easier for the larger pieces of kit to be installed. We took a narrow service tunnel back to the foot of the main ammunition lift, effectively a link between the two entrances that allowed electrical and other services to reach the ammunition galleries.

Upwards, Onwards and a Pilgrimage

Back on the surface after a splendid visit, we had time (but not enough) to visit the extensive and impressive

Service tunnel that connects the Personnel and Ammunition Entrances and which was used to feed power, water and other services between the two

surface museum. This includes a host of objects from the period, including uniforms, firearms and vehicles. Most impressive were a number of turrets, many removed from Fort Bréhain (that we had circled earlier in the day). These gave a unique opportunity to view all the mechanism at once as normally this is spread across several floors. A number of members said it was well worth a return visit to view the museum alone.

Part of the splendid museum at Fermont, here showing several of the turrets that have being painstakingly transferred and reassembled from other Maginot sites

Back on the road, our route took us past the town of Montmédy which has had a castle on the hill within the town for centuries. The town also gave its name to the fortified sector of the same name which was comparatively poorly defended as it largely faced the Belgian border. From Montmédy we drove to the hilltop position of the church of St Walfroy; at over 350 metres, it commands magnificent views over the surrounding countryside.

David had selected it as our lunch spot – a great choice. The church has been on pilgrimage routes for centuries and was substantially damaged during World War II (the hill was being used as an observation point by the French). Postwar reconstruction took place and the bulk of the church is now in concrete with the altar still a remnant of the earlier structure.

Petit Ouvrage de La Ferté

Our afternoon visit was a further short drive and was to the *petit ouvrage* of La Ferté. This is an unusual fort in a number of respects – its position, configuration details, surface remains, and its battle history. Firstly it is the westernmost fort of the main Maginot Line; the line further west is composed of blockhouses (pillboxes) of machine gun and light anti-tank capability only. As a result of this, it lacks the supporting overlapping fire of adjacent forts and was an obvious target for attack.

The immense damage caused to one of the GFM (observation and machine gun) cupolas at La Ferté caused by incoming 88mm anti-tank shells. Three French defenders lost their lives here on 18 May 1940

Secondly, it was built late in the construction period and funds were severely limited. Unusually, although there is a deep-level tunnel connecting the two fighting blocks, there are no underground barracks, plant rooms or main ammunition stores. It also seems that material was in short supply and (for example) blast walls within the blocks were built without steel reinforcing bar. As a result of these shortfalls, troop accommodation and storage of fuel and ammunition were within the surface blocks which combined to mean that a concerted attack rendered the fort extremely vulnerable.

On the surface, the fort has retained far more of its surrounding physical defences than any other fort I have seen. There are still substantial bands of both anti-tank and anti-personnel barriers. The former is in the form of closely-spaced embedded steel rails and the latter comprises barbed-wire entanglements. These give a clear impression of how all forts would originally have been protected.

Part of the extensive surface defences at La Ferté Petit Ouvrage. In the foreground are banks of anti-personnel barbed-wire entanglements. Beyond, the substantial belt of anti-tank rails. The commanding view from the fort is also clear

Lastly, the fort came under sustained German attack, the tragic effect of which was that the entire French garrison perished. As a result, La Ferté is known as the Sacrificed Fort (*l'Ouvrage Sacrifié*). We were to hear the story of this tragedy as we explored the site.

Battle Scars

Our visit started with a short video in the visitor centre which dramatised the action that the fort saw and set the scene for our visit. Our guides were local volunteers Roget and Richard, whose knowledge was extensive. Our guide was Richard who was originally from the UK but now works locally as an English teacher.

General view of Block 2 at Fort La Ferté. The combination weapon rotating turret (centre) has been dislodged by explosive charges

We started the tour on top of Block 2; although three blocks were planned, only two were constructed. Like most *petits ouvrages*, access was via a combat block

rather than having separate entrance blocks. From above we could see the anti-tank and anti-personnel defences and extensive craters caused by incoming German 210mm shells. The only smooth area was the site of the wartime burial of the fort's garrison. A cemetery and war memorial to those who died within the fort lies a hundred metres or so away.

The main armament Block 2 was a 'mixed-weapons' retractable turret, housing parallel-mounted twin machine guns and a 25mm anti-tank gun. The turret was dislodged and sitting proud of its housing and showed traces of where explosive charges had been placed. The nearby observation/machine gun cupola had very significant impact damage from the German assault; you could put your hand some distance into some of the impact indentations and feel the pointed hollow formed by the incoming shell.

Close-up of the rotating turret at La Ferté blown off its mounting. The location where the explosive charge was positioned can clearly be seen

Three kilogram German explosive charge as used to disable the turret at La Ferté

Entering the fort below us, we crossed the usual diamond ditch via a sliding drawbridge and progressed along a dog-legged passage fitted with an air-lock. The machine gun protecting the entrance was mounted beneath an observation dome and the room showed the evidence of the German attack of 17–18 May. The rear wall of the machine gun casemate has been completely flattened, with the still extant bunks immediately behind showing their contorted frames. Evincing the haste with which the fort was completed, the strongest blast door protects nothing but the toilet.

The damage within Block 2 at La Ferté shows the destruction wrought by the German attack including the collapsed (and unreinforced) blast wall.

Stairs lead down a to a lower level which housed filters and generators; unlike larger forts, the only electrically driven apparatus was for the air-handling plant. We examined in detail the mixed weapons turret mechanism and were able to climb three or four at a time into the turret itself. The operation of the turret was described and the counterbalance beam behind was an impressive size. The movable turret weighs over 50 tonnes on three levels. We know that during the German attack explosive charges were used both on this turret and the observation cupola in the block and the resulting explosions within the block itself caused extensive fires.

This view of the staircase below Block 1 at La Ferté gives a good impression of the depth of the communication gallery beneath

Retreat to the Gallery

Following in the footsteps of the French defenders in escaping the fire in the surface building, we descended around 30 metres to the tunnel linking the two combat blocks. This is around 275 metres in length, measuring around 2.35m high and 1.2m wide. The usual barrack block is completely absent but about halfway along is a side room containing the incoming telephone cables and a 150m deep well. Further along the twisting passage is a small infirmary with two bunk beds.

Incoming telephone cables at La Ferté; the well is in the same side chamber but largely obscured by the cables

The final side-chambers house a kitchen and, immediately opposite, storage for its fuel – the stoves could operate on both coal and fuel oil. At the rear of the kitchen is a small food-storage area. Just before the staircase that climbs to Combat Block 1 and through an airlock is a passage that sits above the fort's sewer. In the first section are some recesses in the wall that would have supported planks and provided an emergency mortuary. Sadly for the occupants the sewer was not equipped for use as an emergency exit, which was the case at many Maginot forts.

The beginning of the sewer passageway at La Ferté. The niches set into the walls were intended to support planks to provide the fort with a temporary mortuary. Photo Martin Dixon

Given the absence of side rooms, one can imagine that on retreating from the burning combat block, the garrison would have occupied much of the communication gallery. Although records from the fort itself have been lost, those from their Headquarters show that the occupants of fighting block 2 were joined by those from block 1, as that too was set on fire after a sustained attack.

Over and – eventually – Out

The defending troops were equipped with respirators but these were designed for use against poison gas attacks rather than the products of combustion and it is thought that those who were not killed in the surface blocks during the German onslaught succumbed to carbon monoxide poisoning. With no escape route, the last recorded message was sent at 0539 on 19 May 1940 and after that ... silence.

This final message, sent from the room where the telephone cable arrives from above, reads: *No change in the situation.... it is now six hours that we have been wearing the gas masks. Heavy black smoke has filled the gallery; there is no more light and the situation is frightening.*

Communications room at La Ferté

The Germans forced entry to the fort later on 19 May but it was not until the 28th that they were able to access the lower-level gallery. They found a number of bodies

behind an improvised barrier of packing cases. According to German records it was 2 June before the bulk of the bodies were found in the passage above the sewer outlet. The bodies were removed to the surface and given a mass burial.

Fighting Block 1

We re-ascended 130 steps up to Fighting Block 1. This is similar in layout to Block 2 where we started our visit. At a lower level we found the air-filtration room, generators and accommodation for the Commander and his troops. The intake for the air-supply to the gallery below is taken from the top of the stairs – a design flaw that was to feed smoke and combustion products to those sheltering below.

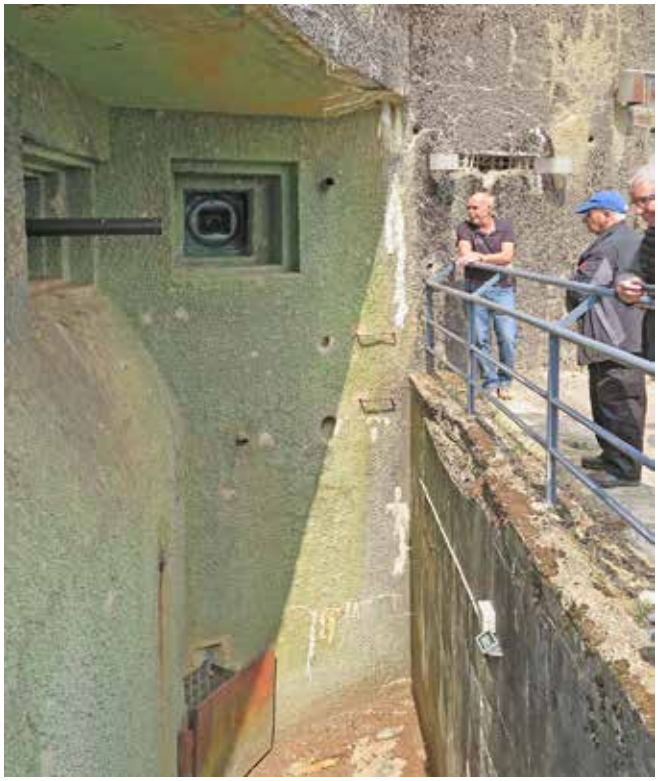
Up another short flight of stairs and we were at surface level. This block has four cupolas (two observation and two mixed-weapon). There is also a casemate holding two machine guns, one of them interchangeable with a 47mm anti-tank weapon. Used shells were fed down a chute that ended in the ditch outside and there was also a chute through which hand grenades could be dropped into the ditch. The grenade's timing fuse was automatically set as the device fell out of a narrow tube.

Anti-tank and machine gun embrasures protecting La Ferté. The one at the left has interchangeable anti-tank and machine gun armaments

Outside, Block 1 is less damaged than Block 2 as it didn't lie in the direct line of the German onslaught but still shows battle damage. The surface of the fort was targeted by neighbouring French artillery so some of the damage may be from this defensive fire. Our visit over, we reflected on the tragedy that overtook this fort after the fiercest fighting of the whole Maginot Line as we returned to Thionville for the night.

Monday 9 May

After recharging our batteries (literally and figuratively) overnight, we boarded our coach for what promised to be a fine day – both meteorologically and historically. Our route took us through the town of Thionville and we passed some of the city's older defences, in particular those built by Vauban from around 1680–1700. We also



Part of the moat (fossé diamant) at La Ferté. Two outlets can be seen on the facing wall; one for spent ammunition and the second for dropping grenades through

passed the (restored) Tour aux Puces – literally Flea Tower – which originally dates from the 11th century and still has cannonballs embedded in its facade.

As we progressed through the town we were briefly on the route of the American troops who liberated France en route to Germany. The route is marked by a trail of milestones every kilometre (known in French as *bornes*, literally bollards) which, starting in Normandy, stretch for over 1,000 kilometres. Thionville itself was liberated on 12 September 1944 but onward progression involved crossing the Moselle River. Some of the Maginot forts, by now in German hands, harassed the advancing Americans during November 1944.

Workshop within Immerhof, still in use by volunteers

Our first site of the day was Petit Ouvrage Immerhof – part of the Fortified Sector of Thionville. For more details of the rest of this sector, *Subterranea* issue 55 has an

extensive article recording the explorations of Sub Brit member Clayton Donnell in 1988. The fort is unusual in that it was constructed entirely by cut and cover due to the high water table. This has perversely actually helped in the preservation of the site as great attention was given to the drainage of the surrounding land while it was being built. If you are driving by car to Immerhof (as one of our party was) you should take care to enter the correct location into Google Maps!

Petit Ouvrage Immerhof

Immerhof filled the gap between the *gros ouvrages* at Molvange (to the west) and Soetrich to the east. Its main offensive weapon was an 81mm mortar, particularly useful for filling in any dead ground between the two major forts. This section of the Maginot Line provided protection for the iron and coal mines that surrounded Thionville – exploration that would have to wait for another visit. Immerhof saw little action in the war and the garrison left on 30 June 1940 after the French armistice of 25 June.

The fort was then occupied in turn by the Germans, Americans, French and NATO before being bought by the nearby town of Hettange-Grande. The local group of volunteers have done an exceptional job in restoring the fort – without doubt the site was in the best condition of everything we saw on the trip. Our guides were dressed in period army uniforms and their relative sizes meant they were known as *Monsieur Gros Maginot* and *Monsieur Petit Maginot.* We were guided by the former, in reality Jean-Paul.

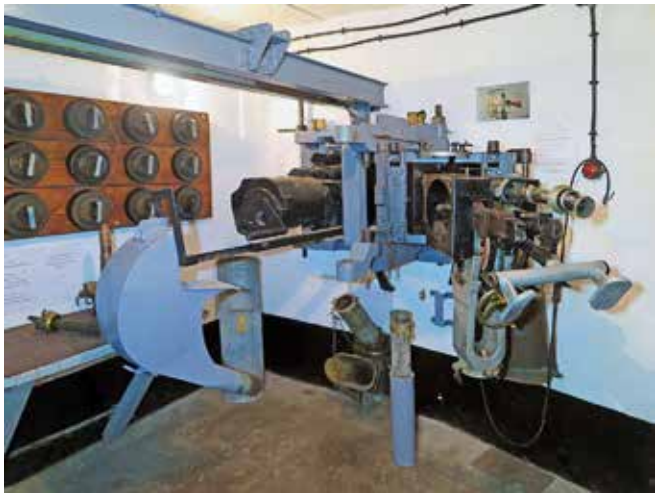
Our two guides and translator at Petit Ouvrage Immerhof. Sub Brit treasurer Tony Radstone awaits the action

Outside the main entrance block a small section of barbed-wire entanglement remained, as did the stumps of the original anti-tank defences. The hooks above the entrance and in front of the block that supported the camouflage netting were very robust (at many forts they are just bent rebar). We were told one veteran recalled riding down the steel mesh netting on a motorbike before the German invasion. The brackets that supported the fort's radio aerials were also present – they would have been as high as possible while still protected by the camouflage.

Once inside the fort, it felt immediately different from previous structures. Because it was built by cut and cover, the corridors are flat-roofed rather than arched and the whole fort is on a single level. The paintwork and signage is in exceptional condition, and the feel was of a structure recently vacated rather than an 85-year-old relic.

Deadly Camembert

Our first stop was in the casemate that protected the main entrance, equipped with a pair of dual machine guns, one of which could be swapped out and replaced with an anti-tank weapon. We had a detailed explanation of how the machine guns could be fired together or separately to reduce overheating; the barrels could be removed and immersed in water in extreme circumstances. The magazine for the machine guns was a circular clip-on design, holding 100 rounds which wouldn't last long at 650 rounds per minute. Because of its shape, the magazine was nicknamed a *camembert*. The entrance block also held the usual observation/light weapon cupolas.



Multi-purpose embrasure at Immerhof, anti-tank weapon to the left and machine gun to the right. The machine gun magazines (known as camemberts*) are mounted on the left-hand wall.*

Moving along the roughly Y-shaped corridor, we entered the main turret for the fort's 81mm twin mortars. We were told that this was the only remaining such turret that operated both manually and electrically although disappointingly neither method was demonstrated. The weapon was fully retractable and weighed around 150 tonnes.

The controls for the turret mortar, in perfect order but not demonstrated

The firing rate was up to 15 rounds per minute; the range of the weapon was a comparatively modest 4km (Immerhof is about 4km from the Luxembourg border and it was general practice for the weapons not to fire across an international border so they could not be classified as offensive weapons). The mortars could either have contact fuses or be set for air detonation. We were told that the turret could be mechanically programmed to operate a barrage – either advancing or retreating. The fort allegedly used wild dogs for target practice which conjured up a rather grisly image.

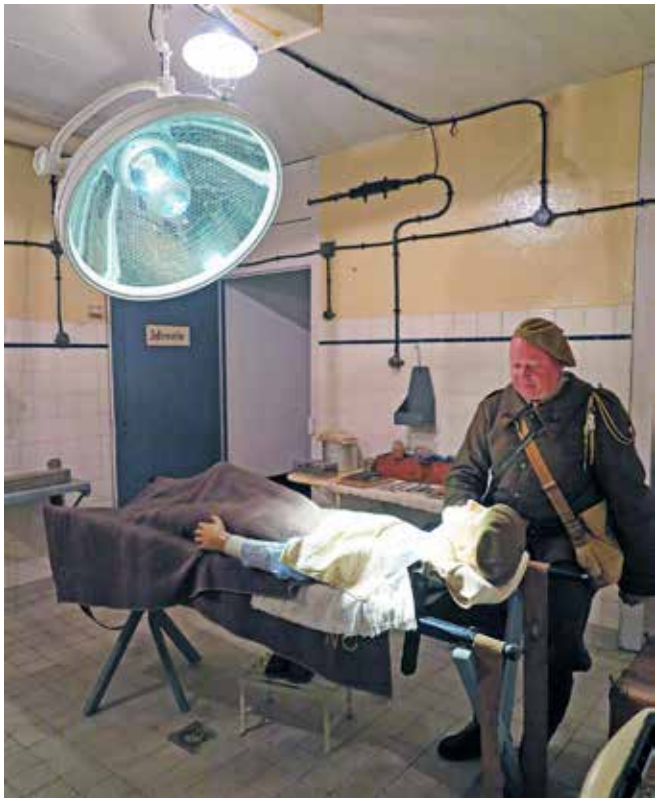
The counterbalance arm beneath the turret at Immerhof. The pit to the left contains the balance weights

Immerhof Barracks

We had an extensive tour of the barrack block, which seemed quite extensive for the 200 occupants. The usual three-tier bunks were adjacent to washrooms, with more comfortable quarters for NCOs and Officers. The Command Post had been turned into a small museum which included a 3D model of this sector of the line, showing the fort's position in a valley, supported by heavier artillery on the high ground to each side.

Fire control room at Immerhof. The blackboards record sightings from the observation posts. The modern 3D plan to the left shows the position of Immerhof relative to neighbouring forts

Other services included a kitchen (converted to electric operation during NATO days), food stores and a small infirmary. The usual well was much shallower than usual. The fort only suffered one fatality during the war when 20-year-old Corporal André Rabu was killed on patrol outside the fort on 14 June 1940. We were told he was brought back to the fort but died in the infirmary as his femoral artillery (sic) had been severed by shrapnel.



The infirmary within Immerhof, where the only recorded conflict death was unsuccessfully treated

On the plant side, twin generators provided electrical power – they had been replaced in NATO days but one of the volunteers had spent months refurbishing two authentic examples which are now in their place. Filter rooms and air-handling provided clean air with a slight over-pressure. Workshops (still in use by the volunteers) included a fully equipped forge, located surprisingly close to the main turret.

Restored generators at Immerhof with associated period switchgear

Sadly, our guide had spent so much time describing the

fort's features that we were unable to visit turrets 1 and 2 which although much smaller (housing machine guns) would have completed our tour. Our request to make a quick visit – they were only about 100 metres distant – was met with the lights being turned off and the group escorted out. Back outside we did have time to visit them from above and we were treated to a fly-past from French Air Force Mirage fighters – possibly from the base at Luxeuil-Saint-Sauveur.

Friendly Fire

En route to our final Maginot site, we took a short deviation to pay our respects at a Commonwealth War Grave. The grave was one of two in the civilian cemetery

The grave of Corporal Thomas Priday, who died on 9 December 1939, officially the first British soldier to be killed in action during World War II

of Luttange and was of Corporal Thomas Priday. His death was recorded as the first British Army fatality in action during the war. He died on 9 December 1939 at the age of 27 while serving with the King's Shropshire Light Infantry.

Although he died in action, there is a deeper tragedy in that he succumbed to friendly fire. Whilst on patrol supporting the Royal Engineers, a French mine was accidentally detonated and British forces mistook the explosion for an attack and opened fire. Priday was taken to the village hospital in Luttange but died the same day. On his grave are inscribed the words 'Thoughts drift back to bygone days; life moves on, but memory stays.'

After reading the ode of remembrance in memory of Priday and all the other fallen, we took the short journey to the Gros Ouvrage of Hackenberg. A kilometre or so before the fort we passed through the small village of Veckring. Here was the former surface barracks where around a third of the fort's complement (and those with only surface duties) would have lived between spells underground.

It was the largest barracks we passed, with Officers' quarters and training areas as well as barrack blocks for other ranks. The site was now a paintball venue and on a private trip would make an ideal visit to contrast with the below-ground exploration.

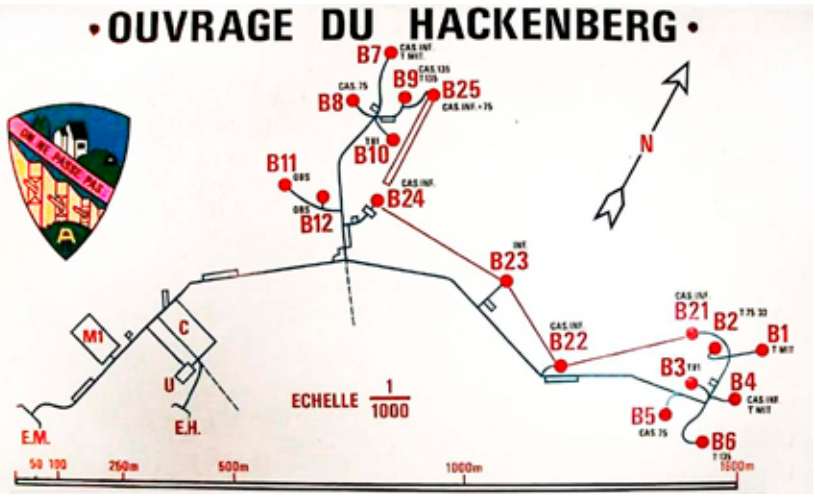
Arriving at Hackenberg, we found the parking area refreshingly overrun with schoolchildren who were having a day out to celebrate Victory Day which fell the day before. We took our packed lunch sheltered by trees and in sight of a span of the Mulberry Harbour which had been re-purposed after victory to repair a local bridge and had now found a third home.

Saving the Best (and Biggest) till Last

Hackenberg is generally held to be the largest Gros Ouvrage of the Maginot Line, with seventeen combat blocks as well as the two protected entrance blocks. The underground passages are reported to extend to over 10 km. Our guide Quentin spoke perfect English and took us on what I would judge to be the best tour of the weekend.

Construction of the fort started in 1929 and was finished in 1935. It protected the approaches to Metz, being part of the Fortified Sector of Boulay. The contours of the land mean that the armaments are in two groups, with a valley between; at its maximum the galleries are an impressive 96m deep. Early plans would have doubled the size of the fort but never saw fruition.

Our tour took us through by-now familiar elements starting at the ammunition entrance, now labelled with its original designation of A19. The 60mm railway extended



Plan of Hackenberg, showing its immense size; left to right is over 1.6 km and there are 17 Combat Blocks

outside the fort and could have transported up to 240 tonnes of ammunition per day. Unlike Fermont, which we visited the previous day, the topography allowed for the main galleries to be sufficiently protected without a descent by lift or stairs from the entrance blocks.

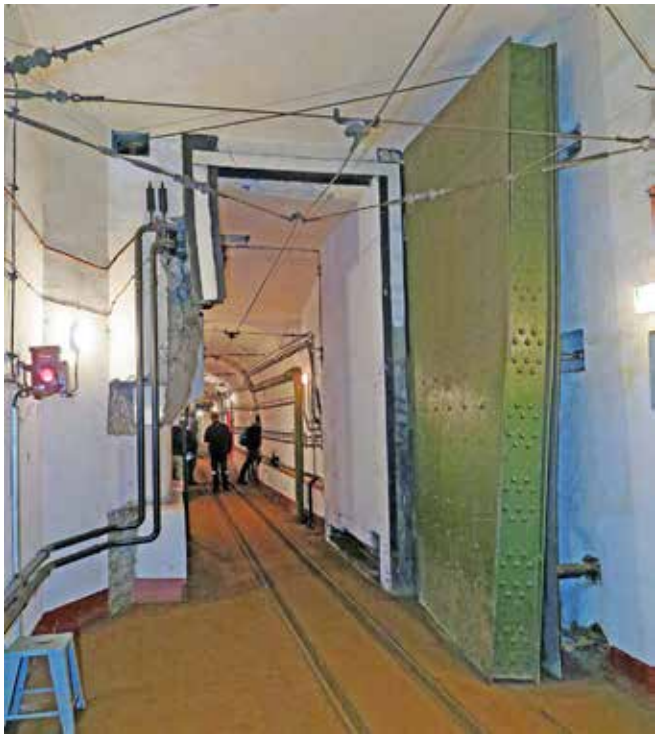
The exterior of Hackenberg Grand Ouvrage, showing the well protected ammunition entrance

To the left of the main passage lies the main (M1) ammunition store with nine separate bays for the different calibre weapons – ranging from small arms through 37mm anti-tank right up to 135mm shells. The overhead hoists are missing from the M1 access tunnel as the Germans made modifications to convert part of the complex into an underground armaments factory. They also blew up the third bay of the magazine on their retreat from the fort in 1944.

One of the nine cross-passages in the main ammunition magazine at Hackenberg. The (modern) sign shows the plan and lists the calibres stored. Ammunition was received along the left-hand tunnel and dispatched on the face shown in the photo.

Blast Door Damage

Leaving the magazine we passed through a substantial blast door weighing around eight tonnes; it was slightly modified to allow plant for the German factory to pass through. The door still shows the effect of the blast wave of the massive explosion from the German destruction of part of the magazine.



Main blast door protecting the tunnel that leads out of the area of the main magazine. Part of the frame (left) was removed by the Germans during refitting as a wartime factory. Distortion of the door is apparent after the Germans blew up part of the magazine prior to their hasty departure

Up to 1,200 troops occupied the fort and, as we passed the kitchen area, we were told that each soldier was entitled to half a litre of wine per day. There was also beer on tap for those off-duty; consumption is reported to have peaked in November 1939 when the fort's garrison was boosted by the arrival of 51st (Highland) Division – part of the British Expeditionary Force. The fort was one of the last French units to surrender following the June 1940 armistice.

Much of the rest of the barracks was destroyed as part of the German factory conversion and most of the area has been converted into an impressive museum. The impressive plant area is substantially unchanged,

The large generator and part of the switchgear in the electrical plant area of Hackenberg

apart from the upgrading of the generators by NATO in the 1950s (the fort was nominally repurposed as an underground hospital but never commissioned) and removal of asbestos exhaust piping. As well as the exhausts, there was lots of other pipework, including diesel, heating, water and air. Each generator used 60 litres of diesel per hour so three months' supply demanded huge storage tanks.

Wall tiling in the generating station. Photo Martin Dixon

Riding the Metro

We next boarded the underground railway, arguably even more authentic than Fermont as the original catenary wires had been retained. Our journey took us to the western set of fighting blocks, a total distance of around 1.5km. Around a kilometre into the journey the tunnel to the eastern fighting blocks branched off. These are a further kilometre distant but have not been visited for many years due to geological problems. These seem to result from the swelling of a layer of gypsum which has caused distortion and collapse.

Our organisers Tony and Richard prepare for their Metro ride at Hackenberg

We disembarked the train at block 9. which houses a 135mm mortar turret. The option of the stairway or original lifts was on offer to ascend 40 metres – many of us chose to do one in each direction to maximise the experience. We had been told that the depth of each step reduces towards the top of the stairway to ensure that tiring troops could maintain the same step rate and not delay those ascending behind. A return trip with a tape measure is called for to prove this construction detail! The drop-down half-door closing the lifts wouldn't pass current health and safety legislation but it was good to see it hadn't been modified.

The 135mm mortar or howitzer turret (the French name of *lance-bombe* translates as bomb-launcher) was on three levels with the controls being on the middle level. Below lay the counterweight and above was the 'business end'. Targets were selected and elevation and bearing signalled through from the control post 40 metres below. It took a total of 21 soldiers to load and fire the weapon.

Fully operational Turret

We were delighted to find that the weapon was fully operational both in the rise and fall of the so-called 'eclipse' turret and in its rotation through 360 degrees. This was fully demonstrated to us, showing a very smooth and impressive operation. The very same turret was demonstrated to King George VI during his visit to Hackenberg on 9 December 1939.

Combat block 9 also held a more conventional 135mm weapon which fired through an embrasure. We briefly viewed this including the empty shell hopper of which more anon. We then took a trip outside through a blast door and over the diamond ditch.

The operation of the 135mm mortar turret is described by our guide Quentin

On the surface we could see how little was visible above ground of the weapon in its resting position. The armour in the turret is over 35cm thick and the whole mechanism

Now you see it, now you don't. Sub Brit members form an appreciative audience viewing the operation of a Hackenberg 135mm Turret. Photos Linda Dixon

weighs over 160 tonnes. As we positioned ourselves round the turret, Quentin signalled into the fort and the mechanism was once again demonstrated for us so we could see it magically rise and rotate through a full 360 degrees. The fort saw some action in May 1940 and was one of the last positions to yield to the Germans after the armistice was signed, finally vacating the fort on 4 July.

We walked above ground to combat block 8, whose firepower consisted of three 75mm guns. The front of the block was badly damaged by incoming shells; fired however not by the Germans but by the Americans during their liberation of France. Germans within Hackenberg fired from this casemate onto the US 3rd Army on 14 November 1944; more than 90 shells arrived in around 90 seconds and clearly the threat had to be eliminated.

The substantial damage caused to Block 8 at Hackenberg, caused by the US assault during their liberation of the surrounding area in November 1944

On 16 November the US Army responded with 155mm self-propelled guns and with accurate firing put block 8 out of action. Block 8 posed a particular threat as it was one of the blocks whose armaments faced towards France to counter a flanking attack. However these France-facing blocks usually had thinner concrete (1.5m versus 3m thick) to provide a weak spot to aid in the retaking of the fort, which worked to the Americans' advantage.

Damage inside Block 8; the gun has been reinstalled but is original to the fort

Helter Skelter

We re-entered the fortification via block 8 and again had the option of descending via the original lifts or stairs. Those who chose the stairs were able to view the helical chute – to all intents and purposes a helter skelter – down which spent shells were despatched. Once at the level of the main communications passage we reboarded the train and made a reluctant return to the ammunition block entrance.

A small shop at the exit sold mainly publications – including an excellent guide in English – raising money for the volunteer group who open the fort. They acquired Hackenberg in 1975 after NATO had vacated and they provide a first-rate experience for visitors. There are also surface walks but our timetable demanded that we reboard the coach and return to the hotel for refreshment and reflection.

Tuesday 10 May

The following morning a long drive took us homeward, roughly retracing our outbound route. On the outskirts of Dunkirk we passed the extension of the Maginot Line – effectively a line of pillboxes with considerably less firepower than was needed to counter a major armoured assault. We could also see the high ground where General

The 'Helter Skelter' down which shell cases descended to the main gallery level 40m or so below for recycling. The chute is contained in the same shaft as the ammunition lift and surrounding staircase

Heinz Guderian positioned his Panzer group during the Allied evacuation at Dunkirk. By coincidence it was 82 years to the day since Germany invaded the low countries and Churchill became Prime Minister.

Acknowledgements and Thanks

Overall we had had a terrific long weekend in ideal weather. We saw a real cross-section of the Maginot Line defences that promised so much more than they would eventually deliver. My report leans on our expert guides as well as my own notes and reading. If any mistakes have crept in the description of such a complex defensive system then they are entirely mine.

My sincere thanks to everyone on the trip for their company – travelling with fellow members is always a big part of a trip for most of us, most especially after the long absence from overseas excursions due to Covid. All photos unless otherwise captioned are by Clive Penfold who, as usual, has made his images readily available. Particular thanks to Tony Radstone and Richard West for making all the arrangements for the trip.

Previous *Subterranea* magazines describing visits to the Maginot Line (and Eben-Emael) include numbers 1, 2, 24, 30 and 55. These are available in our online archive or via publications@subbrit.org.uk

All photos Clive Penfold unless stated.

The coal mine at Brora, Scotland

Paul W Sowan

Most economically workable coal deposits worldwide exploit seams of Carboniferous age, although there are exceptions. Tertiary era lignite was once mined between lava flows in Iceland and the Faroe Islands, for example, and closer to home a small mine at Brora in north-east Scotland worked coal of Jurassic age.

Opencast coal extraction at Brora dates from the 16th century, and in the 1770s a shaft was sunk on the south side of the Brora river about three quarters of a mile west of the village and its small harbour. This conveyed coal to the harbour by way of a narrow gauge railway with wooden rails, employing horse traction. The enterprise failed in 1810 but was soon followed by a modernised establishment north of the river where a new shaft 83 yards deep commenced work. A new tramway, with cast iron plate rails, was installed, and an on-site demand for coal was generated by the establishment of a brickworks and salt pans in which sea-water was evaporated. An annual output of about a thousand tons of coal or more and 10,000 bricks was achieved, but this second enterprise also failed with the salt pans going out of business in 1828 and the mine closing in the 1850s. The salvation of the enterprise was the opening of the main line railway in 1871, where trains still run northwards from Inverness to Britain's two northernmost termini at Wick and Thurso. Brora was intended by its promoter, the Duke of Sutherland, to become a manufacturing town where, amongst other things, steam locomotives would be built.

Brora Colliery c1940s

He therefore purchased the colliery, brickworks, and tramway for the resumed mining of coal for the works and engines. The tramway was taken up and replaced by a modern (for the 1870s) railway, the tram plates being re-used underground as the mine workings expanded. The first steam-hauled train serving the branch to the mine from 1871 was the first (and possibly the last) to be built locally. The mine continued in work into the middle of the 20th century, and indeed your scribe photographed the headframe still in place in or about 1960, and collected a souvenir BRORA stamped brick.

SOURCE: FREW, Iain D.O., 1960, The Brora colliery. *The Railway Magazine* 106 (705), January 1960, 55 – 58.

The Membership Questionnaire: Conclusions & Proposals

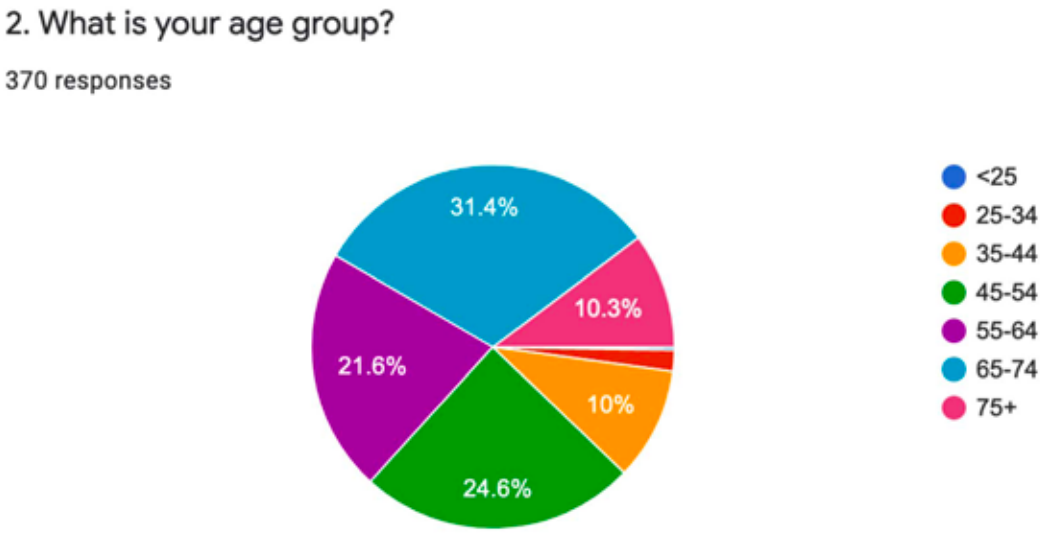
Tim Wellburn

Last autumn we undertook Sub Brit's second membership survey, a decade on from the first. 378 members kindly took the time to complete the questionnaire, which is a good response rate for such an exercise. It allows us to assume that most members wishing to express views did so, and that the information gathered through this exercise is sufficiently broadly-based to inform our thinking about Sub Brit's future activities and development.

In *Subterranea* 58 we published a summary of the answers provided to the questionnaire's quantitative questions, together with a brief commentary on these. Extensive feedback was also provided through the responses to the free-form questions. To aid our analysis, James Buller collated the latter under a number of different themes from which we were able to identify some common threads. We have been considering both of these information sets to determine what implications they have for Sub Brit's current activities and the way we do things; what we might do differently or in addition; and to inform our future strategy.

What follows is a summary of our conclusions, proposed changes, initiatives and aspirations.

Recruiting the next generation of members



As noted elsewhere, the Sub Brit community is loyal but ageing. Around half of our members are in the 45-65 age range, as was the case in 2011. However, the proportion over 65 has increased from 15% to around 40%, and only 12% are now under 45 – compared with 33% a decade ago. In 2021 over 38% of members had belonged to Sub Brit for more than 10 years, compared with only 18% in 2011.

The loyalty of our members speaks for itself, but the ageing membership profile is a key strategic challenge facing the Society, requiring us to find ways of actively attracting new generations of Sub Britters.

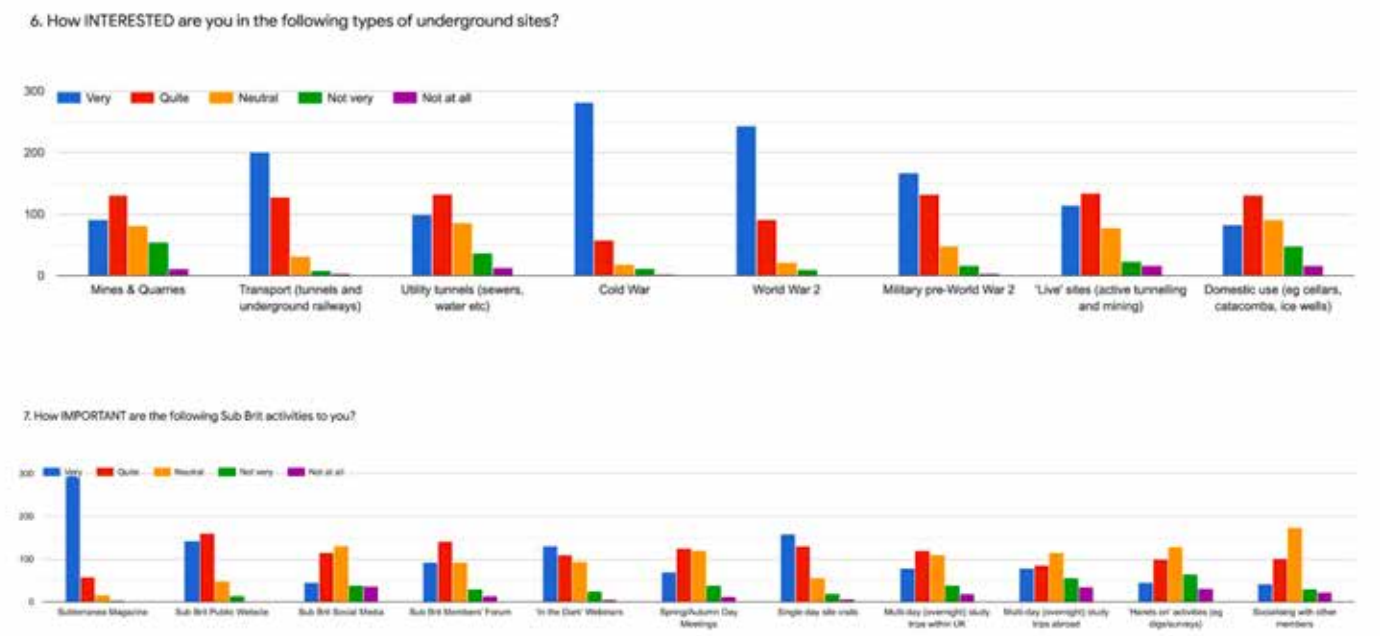
We were, in fact, working on potential recruitment initiatives targeted at students and at selected businesses before Covid disrupted our lives. However, these were large undertakings for which the Committee was not then adequately resourced in members or available time. This remains a constraint, so we will try to develop and pilot one or other

scheme on a trial basis. This could then be expanded (with additional help) were it to prove successful.

We have examined the potential role of social media, which is discussed below.

We have also looked at the suggestion that we more actively 'sell' Sub Brit on our public website Home page. This certainly seems desirable but appears to require technical changes to the site which currently are not feasible.

Members' interests and the relative 'importance' of Sub Brit activities



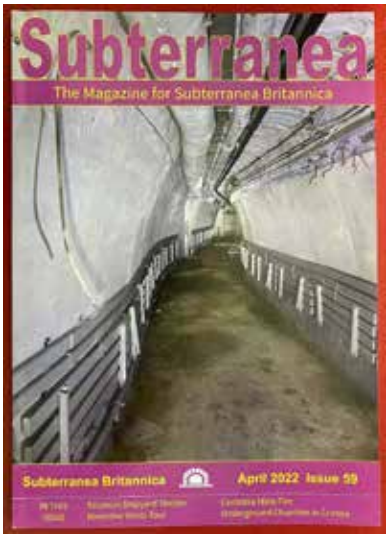
The Cold War, WWII, transport, and military pre-WWII are members' dominant interests – in that order, for those replying "very interested". However, the first three are of similar importance to members if one considers all levels of positive interest.

The "very important" category Sub Brit's activities is dominated by *Subterranea*, but the website and single-day trips are not far behind if the "very important" and "quite important" responses are combined.

Single-day visits were significantly more popular than multi-day UK or foreign trips.

We will try to reflect these interests, while remaining a 'broad church'. In particular we will keep seeking more opportunities for single-day visits – although much greater member input will be needed to help to deliver a step change in this activity.

Subterranea



Subterranea is generally regarded as being pretty well 'right' as it is, although this does not mean that we will disregard members' suggestions for additions or improvements. There is clearly a very strong membership preference for a 'hard copy' format (although we will need to explore whether this remains viable for international members).

The pricing peculiarities of the various UK domestic delivery systems mean that it is about a third cheaper to bulk mail 1,000+ copies to individual recipients than to send out 999 or even several hundred fewer magazines. Thus a

reduction in the print run (and physical distribution) of *Subterranea* would significantly raise costs. This is one reason why households with two members continue get a copy each – please bear with us, and feel free to give away the 'spare' to somebody who might be seduced by it into joining Sub Brit.

We already make current issues available in pdf format to those members who need/request them, but in addition to, not instead of, printed copies – for the cost reason described above. Prior years' issues are, of course, now all available online in our archive.

Members' Forum

Members' comments:

"The quality on the forum is quite variable but I guess this is the nature of such sites and sometimes there is a gem."

"The forum seems to contain more talk arguing over moderation decisions rather than content. I would tone down the moderation a little, and not be so precious."

The Forum appears to be widely read and we have since reprinted guidance on how to get posts sent to your email – which is useful if you want to follow a particular subject area, or watch out for something coming up in 'Events'. However, usage is relatively passive, with only 13% of respondents starting topics and 18% replying to them.

Criticisms included lack of engagement/breadth of content and, on the one hand, "junk posts/quibblers" and, on the other, "over-moderation". Moderation is done by a small group of volunteer members, and the Committee does not interfere. In fact, for a good time now, the moderators have been exercising only a very light touch, recognising that posts complaining about moderation can make as tedious reading as 'junk' posts. As for the extent of members' engagement and associated breadth of content – the answer seems obvious: please engage in the Forum by posting or responding, if you can add knowledge or interest to a topic!

In-the-Dark webinars

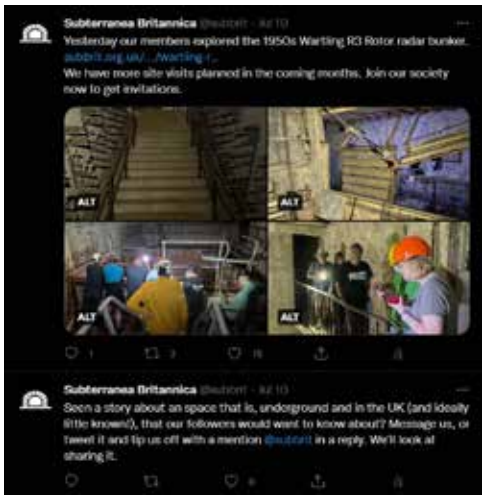
Member comment:

"In the Dark webinars were excellent, and really helped me connect more with the organisation – recognising that quite a lot of members can't/don't join the in-person events for various reasons and supporting them with more engagement would be good for retention/growth."

Our webinars were clearly popular and kept underground interest alive during Covid lockdowns. Some also subsequently attracted very big external audiences (measured in thousands), which is all good publicity for the Society. However, without active membership participation in giving these talks, they have run their course. They are all still available to view on You Tube.

In the place of structured talks, Tony Radstone has started "In-the-Sump" informal online social/chat meetings, which are part of a wider initiative, discussed below, to increase the sense of Sub Brit as a more inclusive and engaged community.

Social media


Subterranea Britannica
Yesterday our members explored the 1950s Wartling RC1 Rotor radar bunker.
We have more site visits planned in the coming months. Join our society now to get invitations.
ALT
ALT
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ALT
Subterranea Britannica
Seen a story about an space that is, underground and in the UK (and ideally little known), that our followers would want to know about? Message us, or tweet it and tip us off with a mention in a reply. We'll look at sharing it.

Sub Britters at large make relatively little use of social media, beyond some Facebook users.

We know that our social media attracts considerable interest, but our 'followers' are not generally members of the Society. With seven times more followers than members, we consider these channels of communication to be important in creating and maintaining wider awareness of Sub Brit, especially among younger generations whom we hope, some day, may turn into Sub Britters. We are therefore increasingly posting 'teasers' such as visit photos that we hope may encourage our followers to join in, as well as explicit invitations to sign up as members. James Buller and his team are to be congratulated in successfully raising our social media profile.

Sub Brit Website

Members' comments:

"The website is a fantastic resource and continues to prove invaluable."

"A great dynamic modern website would reflect well on the Society instead of feeling like a lick of paint on a stagnant site."

There were various ideas for updating and/or developing our website. We have taken note of these suggestions but, as cautioned in the questionnaire, progress here depends on members volunteering technical help in reviewing proposals and in implementing any agreed changes.

We are continuing to extend and update our public site records. The main demand is for more UK locations and more photos. We've seen recent progress as a result of Richard Seabrook's and Neil Iosson's work, including the clickable link to add new sites or updates. Martin Dixon is working through *Subterranea* articles to add links and sites that currently aren't represented, and Martin Briscoe is continuing to earn laurels as our Scotland and ROC 'champion'.

Achieving more content will depend heavily on member contributions. Neil Iosson sparked a remarkable burst of interest in, and posts on, ice houses (taking Sub Brit back nearly to its origins!), so it can be done.

We will be seeking to recruit other 'subject champions' to drive website contributions on other topics in similar fashion, and more 'regional champions' to encourage members to provide new content on a geographic basis. If you would like to step forward in either role – or just make occasional contributions – please let Neil know at: niosson@subbrit.org.uk

Day Meetings

Responses made clear that, unsurprisingly, the quality of speakers was key to attendance at Day Meetings. Accessibility was also essential for many people. Two-thirds of respondents were indifferent to whether we held one or two Day Meetings each year, and attendance does seem to be waning.

We have therefore decided that we will continue to hold the Spring Meeting (at which we also hold the AGM) and that, to maximise accessibility, this should be held in a major city. However, we will schedule an Autumn Meeting only if we can secure sufficient high-quality speakers each year. In line with this, we elected to run an autumn Study Weekend in Edinburgh but with no Day Meeting attached to it.

Site visits

Members' comments:

"Investigate ways of advertising and fair sign-up to make sure it remains as fair as possible."

"Re-run successful tours or visits if over-subscribed and if hosts amenable. Make it easier for small local informal groups to take a contact opportunity or idea forward and to invite or involve other Sub Brit members."

"Recent trips have tended towards replays of earlier ones – we could do with finding some new contacts to give a broader range of destinations/sites."

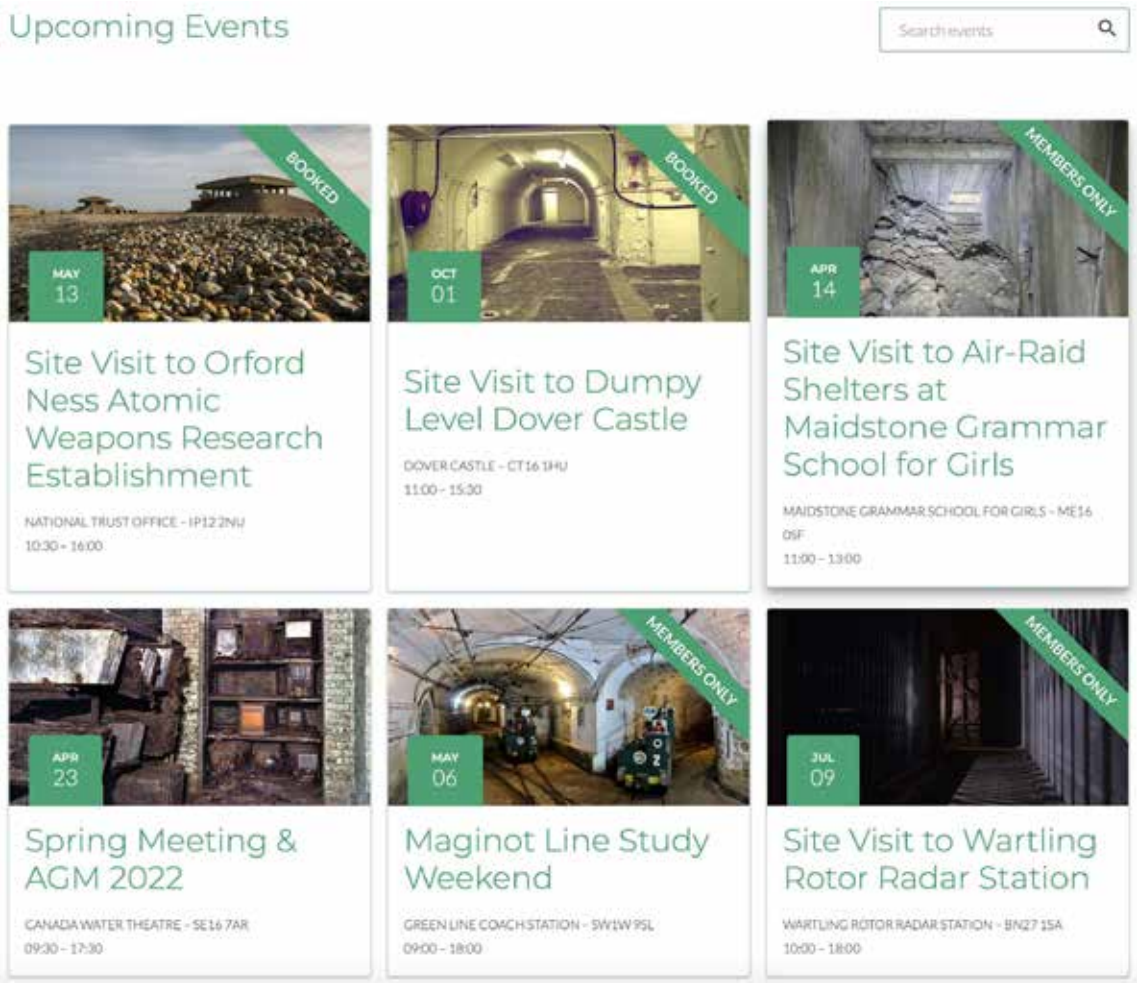
"Repeat or revisit trips we've done in the past. Especially over-subscribed ones."

With group sizes usually limited by site constraints, demand for places is often going to outstrip the number available (although several recent visits have been under-subscribed). Where possible, we have, and will continue to try to run successive visits on the day, or arrange (or support members in arranging) repeat trips at a later date. However, the ability to do this does depend on site availability and the hosts' goodwill and resources. Some sites

are accessible only on certain days of the week; unfortunately this may preclude attendance by some members.

A number of members commented that they had difficulty in getting on trips, with a few feeling that 'old hands' must have some special booking prowess. There is nothing inherent in the booking system that gives any member a better or worse chance of securing a place on a visit than any other member. Events are advertised on the Forum and all members who have given us permission to contact them by email are notified in a group mailing. However, we will seek to ensure better advance notice of events and booking.

Booking is normally now done using the third-party booking service Eventbrite, accessed through your Sub Brit account (log in and click on Events). This allows the whole process, including payment, to be automated. Eventbrite allocates places to members in the order in which they book and compiles a sequential waiting list for the assignment of any places freed-up by subsequent cancellations. This list also serves to indicate the level of unmet demand. If this justifies a repeat trip, we will try to arrange one.


Upcoming Events
Search events
BOOKED
MAY 13
Site Visit to Orford Ness Atomic Weapons Research Establishment
NATIONAL TRUST OFFICE - IP12 2NU
10:30 - 16:00
BOOKED
OCT 01
Site Visit to Dumpy Level Dover Castle
DOVER CASTLE - CT16 1HU
11:00 - 15:30
MEMBERS ONLY
APR 14
Site Visit to Air-Raid Shelters at Maidstone Grammar School for Girls
MAIDSTONE GRAMMAR SCHOOL FOR GIRLS - ME16 0SF
11:00 - 13:00
APR 23
Spring Meeting & AGM 2022
CANADA WATER THEATRE - SE16 7AR
09:30 - 17:30
MEMBERS ONLY
MAY 06
Maginot Line Study Weekend
GREEN LINE COACH STATION - SW1W 9SL
09:00 - 18:00
MEMBERS ONLY
JUL 09
Site Visit to Wartling Rotor Radar Station
WARTLING ROTOR RADAR STATION - BN27 1SA
10:00 - 18:00

The biggest demand was for more day-trips. We put a lot of effort into delivering this as soon as Covid regulations eased, and to date this year Sub Brit has visited: Reigate Caves; Maidstone School shelters; Hollingbourne Auxiliary hide; London Vents (by Routemaster!); the Courtauld shelter group; Crossness, Orfordness & Sizewell 'B'; and Wartling R3 bunker. Beacon Hill and the Harwich Redoubt are booking as I write.

Those in the pipeline include Dumpy Level at Dover; a repeat 'Mail Rail' visit; and the tantalising Mail Rail extended track-walk. Frustratingly, for the latter pair, since Covid stopped play, we, the London Postal Museum and the other stakeholders are having to restart negotiations. This year we have also organised European and UK study weekends: to the Belgian forts and the Maginot Line in May and to Scottish sites in October.

There were also requests for more visits to sites local to individual respondents. Once again, members are probably best placed to propose visits to places known to them, or indeed, to arrange such visits. To help you do this, Dave Maguire has volunteered to act as a first point of contact for any members considering organising a trip. He will provide advice and help or, where appropriate, take on a proposed visit as a Committee-organised trip. Contact him at: dmaguire@subbrit.org.uk

We will also update our written guidance on organising trips and publish it in *Subterranea*.

Improving communication

The maxim that one can always communicate better was reinforced by the feedback, with some respondents seemingly

unaware of the extent of information and products available and/or how to access them. We will publish a full list of all this material and clear information on how to find it.

Other feedback indicated some lack of clarity or understanding about a range of Sub Brit's policies and practices and/or the reasons for them. We will develop and publish 'FAQs' to try to shed light on the more common of these. We are, however, always open to practical suggestions and help in improving anything Sub Brit does!

Whilst we have long published occasional "how to ..." guidance in Subterranea – for example, in the last issue, on how to receive selected Forum posts as emails – we will aim to make these practical help bulletins a regular feature. We hope this may be of particular benefit to newer members who may not have seen earlier information on such topics.

Increasing openness, engagement and involvement of members

Members' comments:

"I feel there should be more transparency to the committee's activities, discussion with members about issues and calls for input/feedback/action which are then acted upon."

"I know the amount of effort it takes to run an organisation like Sub Brit, so don't like to complain or demand more/different, so while not perfect, thanks nevertheless to those that run it."

While improved communication and information will go a certain way towards making Sub Brit a more transparent and user-friendly organisation, we aspire to progress further than this. The questionnaire feedback indicated scope for encouraging the development of a more open, welcoming and inclusive community. There is no single lever to bring this about but, with positive action, goodwill, help and commitment, we believe it can be achieved, adding value to Sub Brit membership.

Subterranea 59 carried profiles of the four newly-elected members of the committee. We will complete the set in future issues, so you can see who is currently volunteering and giving their time to help run the Society, and discover a bit about their motivation and interests. Summary minutes of committee meetings are always published. If you would like to join in our endeavours as a committee member, please let me know!

We have started publishing accessibility information for day meetings and site visits, and this is now being incorporated in our trip guidance as a requirement in organising visits. Obviously, by their nature, some sites will always have restricted access, but we will provide the information necessary for members to make a personal assessment of whether a visit seems feasible.

We will arrange name badges for visit participants, as we do for day meetings, so everyone knows who everyone else is. The trip leader, wearing a Sub Brit 'hi-viz' tabard, is the visible first point of welcome when you arrive.

We are also starting to introduce a feedback option for participants in day meetings and visits, so you can tell us what went well and what we need to try to improve next time round.

Social gatherings

Members' comments:

"Perhaps add a pub/cafe meal before or after a site visit to encourage socialising and chat. Introduce people at the start of a visit."

"Local groups based on geographical locations: meet up socially and for visits."

We have trialled an online social meet-up, 'In-the-Sump' (Tony Radstone's brainchild and sense of humour in the title) taking over from the webinars, and we hope that this develops into a periodic geographically-unconstrained and relaxed get together.

We are also encouraging members to organise face-to-face local meet-ups. These could take any form, but the long-running London-based 'Sub Pub', founded by Sub Brit stalwart Stewart Wild, is a proven format. Now arranged by Clive Penfold, meetings attract around a dozen to twenty members who gather over the course of

an evening on alternate months for a drink, pub supper and a good chat, usually in a West End or City basement bar or other underground venue.

These are inherently small-scale events, reflecting available and appropriate pub space, but are easy to replicate – indeed, several organisers and groups could co-exist in one location. If you would like to try your hand at organising one in your area, please do! Phil Catling (pcatling@subbrit.org.uk) can give you a steer and/or refer you to Clive for practical advice.

Where feasible we are trying to add some kind of social aspect to trips and meetings, even if this is just an invitation to retire afterwards to a nearby pub!

Engagement

I have highlighted above our need for members' help in making Sub Brit an ever-busier more inclusive and engaged Society. This extends over everything that we do, including providing news items and articles for *Subterranea*, contributing to our site records, proposing or organising visits or other events, and participating in the Forum. We will facilitate all this by updating and publishing short 'tool kit' guidance/checklists on how to get involved in these activities, and by providing advice and help, via nominated Committee contacts.

Get Involved!

Organise a 'Sub Pub' social meeting: Contact: pcatling@subbrit.org.uk

Contribute to putting sites on the website: Contact: niosson@subrit.org.uk

Help organise or suggest a site visit: Contact: dmaguire@subbrit.org.uk

Contribute a short article to *Subterranea*: Contact: dmaguire@subbrit.org.uk

Thank you again for completing the questionnaire and for providing such a wealth of feedback to help improve, enrich and advance our Society. We would be very happy to consider any comments or suggestions you may have regarding the conclusions and proposals outlined above: please address these to me at: chairman@subbrit.org.uk

Finally, this review has (out of modesty!) avoided quoting the many positive comments made by members about Sub Brit, but I would like to conclude with two that certainly capture the spirit of the Society for me:

"Sub Brit is unique in what it does, the people and interests it brings together."

"Thank you to all the volunteers who make Sub Brit a fantastic society."

Subterranea Britannica featured in Punch in 1987

Paul W Sowan

Malcolm Tadd, when our Secretary, had notable successes in getting Subterranea Britannica featured in national magazines and newspapers. The 8 April 1987 edition of *Punch*, for example, carried a report from journalist Jonathan Sale on his attending one of our day conferences held at the Royal School of Mines.

Amongst the lectures on that occasion was one by Rod Le Gear on 'Underground Kent', and another by Roger Morgan on 'Underground London'. Both have continued their work and now have substantial bodies of published research to their credit. Rod is still an active member of the Kent Archaeological Society and the Kent Underground Research Group, and has specialised in the archaeology of deneholes and chalk mines. Roger's study of the engineer Thomas Webster Rammell (1814-1879) and his 'pneumatic' trains moved along tunnels by air pressure was published in the definitive and prestigious *Biographical dictionary of civil engineers* issued by the Institution of Civil Engineers.

'As a society', Malcolm was reported as saying, 'we have never had an accident', which is still true after 43 years of organising subterranean visits at home and abroad. He stressed the importance of the 'academic status' of underground studies.

SOURCE: SALE, Jonathan, 1987, Subterranean homesick blues. *Punch*, 8 April 1987, 21 – 22.

London's New Underground Railway Opens at Last

Stewart Wild

Evening rush hour at Liverpool Street station on the opening day. Photo Ian Mansfield

On Tuesday 24 May 2022 the Crossrail tunnels under central London were finally, after years of construction and months of trial runs, opened as a public railway, the final part of the 73-mile east-west link now known as the Elizabeth line.

Most Sub Brit members living within striking distance of the capital will by now have taken the opportunity to enjoy this new underground experience; indeed I know some members were aboard the first early-morning departure from Paddington on 24 May. The purpose of these few notes is whet the appetite of those readers who live abroad or have not yet been able to get to London to see for themselves the architecture and stations of London's splendid new underground attraction.

I do not propose to relate details of the line's construction, history, engineering achievements, problems and huge cost overruns; Wikipedia's Crossrail page has all the statistics any passenger could reasonably want to know. This is a personal view of my first impressions.

The Elizabeth line is magnificent in every way, all on a grand scale. Platforms are long and spacious, air-conditioned and step-free; two stations have inclined lifts alongside the escalators. Safety is paramount, with level boarding, platform-edge doors, clear signage and highly efficient smoke detection and ventilation. There is none of the 'piston-effect' rush of air that you get on other Underground lines.

Trains arrive every three to five minutes and accelerate up to 60 mph. The track slopes upwards on the approach to each station to assist braking and downwards as the train departs.

I happened to board the last of nine carriages on a train with few passengers. I was able to look the entire length of the train and was fascinated to see how it snaked its way up and down, curving to the left and the right, as it made its way through the labyrinth of tunnels, sewers, culverts and other underground infrastructure that London has acquired over the centuries. The famous TBMs had to be very accurate!

It's 06.26 at Abbey Wood as passengers wait to board the first train to Paddington on the opening day

At present Bond Street station has yet to open and the underground section from Paddington to Liverpool Street is not fully connected to its surface link west to Heathrow and Reading and east to Romford and Shenfield; all should be linked up later this year. No need to wait until then, however, to enjoy a ride on the Elizabeth line, the railway of the future.

Henley's industrial WWII air-raid shelter tunnels at Northfleet, Kent

Victor Smith

Looking north along the central latrine tunnel in 2007. Photo Nick Coombs

Formed of tunnels in the chalk, some 55 ft below Fountain Walk at Northfleet in Kent, is a large Second World War industrial air-raid shelter complex. It was created as a refuge for 2,500 employees of the W.T. Henley Telegraph Works and its associated companies, whose Thameside premises were adjacent. The need for physical protection reflected the increasingly destructive and existential threat of aerial bombing and of a national imperative to safeguard skilled industrial workers – and at some places elsewhere, factory plant as well. As such, the survival of this complex evokes a memory of the determination of government, industry and people to survive the onslaught of the German air campaign and to win the war. The shelter incorporated the latest thinking in design and protective measures. This wartime underground heritage is of at least regional heritage importance and might be considered for statutory protection.

This study was preceded by the author's research visit to the tunnels in 2003/4 in cooperation with Thames Defence Heritage and the Kent Underground Research Group (KURG) and by a mention of the site in his report of the Kent Thameside section of Kent County Council's 20th-century *Defence of Kent Project* in 2010. It also benefits from contributions of information and thoughts from Robert Hall and Paul Thorne, also of KURG. This study is also supported by the Kent Defence Research Group of the Kent Archaeological Society and by the Gravesham Heritage Forum.

Background

The threat of bombardment from the air had been predicted since the late nineteenth century by such writers as Jules Verne, George Griffith and, evocatively in 1908, by H G Wells in his *War in the Air*. In the latter, Wells noted the potential for this form of attack to destroy ground targets, including industrial assets and national infrastructure. Coincidentally, and following earlier technical interest, it was in the same year as the publication of Wells' story that the British government formed a committee to consider the possibilities and the threats from the development of military aviation.

This led, over the next five or so years, to a growing recognition of the menace it represented to home defence and, in 1913, a dummy air bombing exercise took place in the Medway area. During the Great War, industry, docks and other assets along the Thames were embraced within an increasing deployment of gun defence, balloon

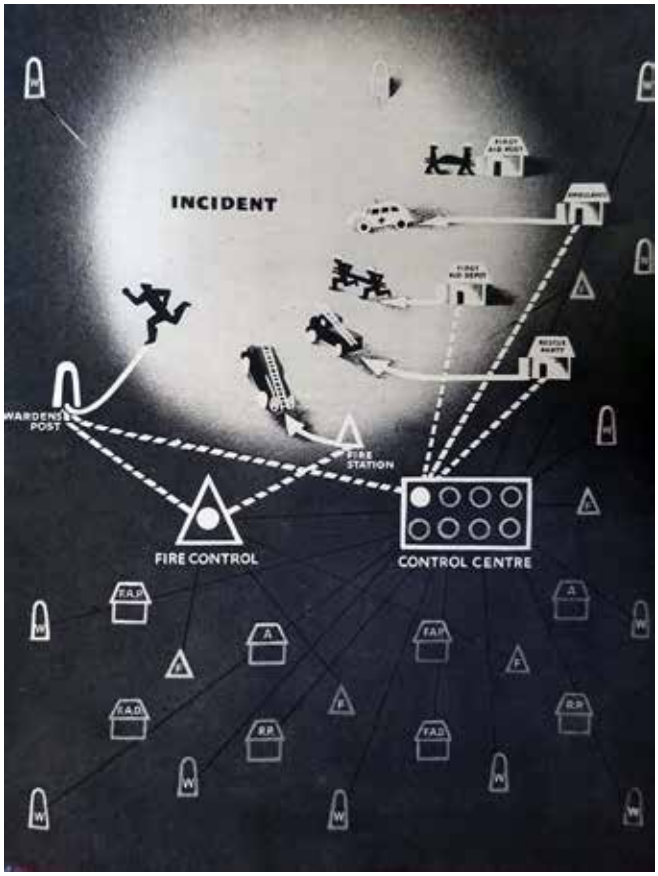
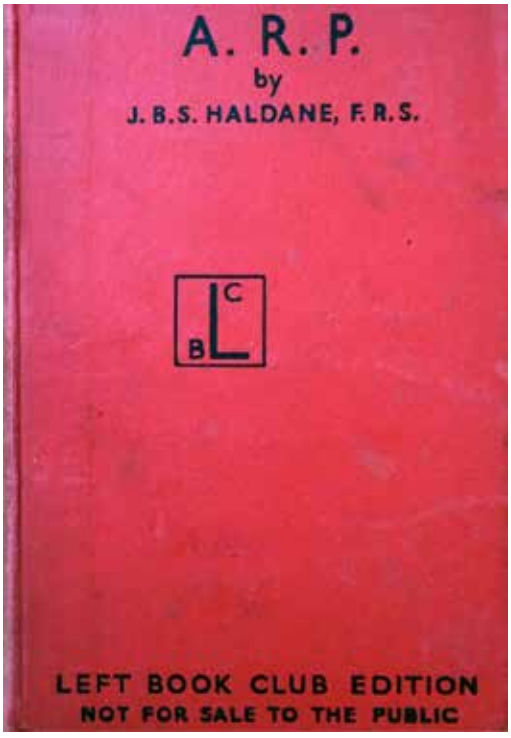
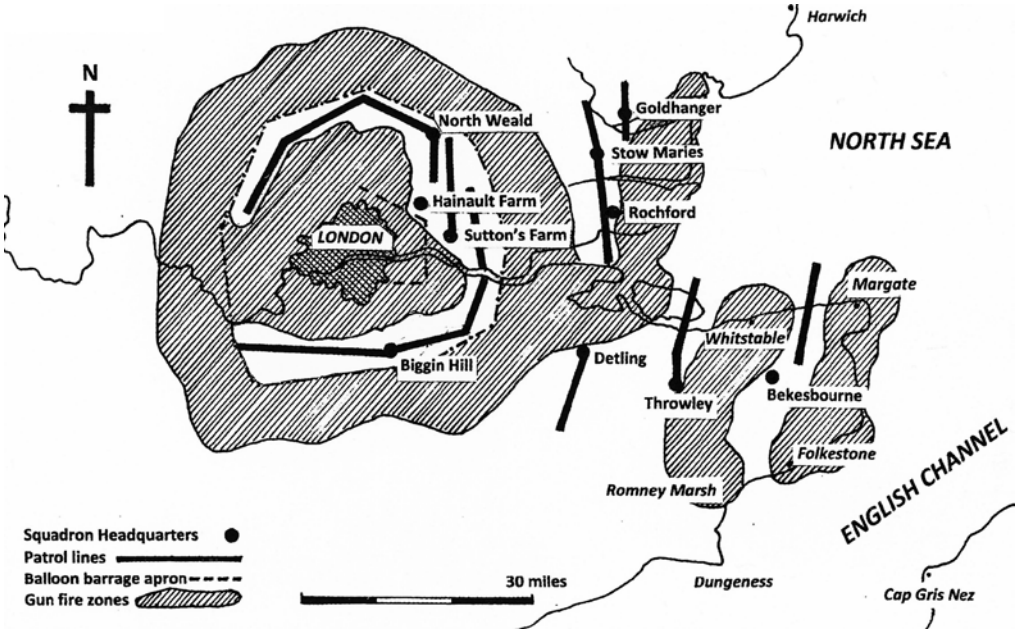


Diagram of a typical civil defence organisation as it evolved during the Second World War: from 'Front Line 1940-41', HMSO, 1942.



Cover of the influential book, 'ARP, by JBS Haldane, London, 1938

Although WWI air attacks proved not to be a serious impediment to the operations of industry or to the war effort, they diverted resources to provide for countermeasures and were a salutary lesson of the likely greater destruction in any future conflict. But, after 1918, the possibility of a new major European war seemed unlikely for some years. By default, in the early 1920s defence planning centred on maintaining military air parity with France, the next most powerful continental state. As part of this, 'passive' air-raid precautions (ARP) began to receive government attention including, on a small scale, the production of bespoke designs for air-raid shelters.



Map of the London Air Defence Area during the Great War. Drawn by Victor Smith 2015

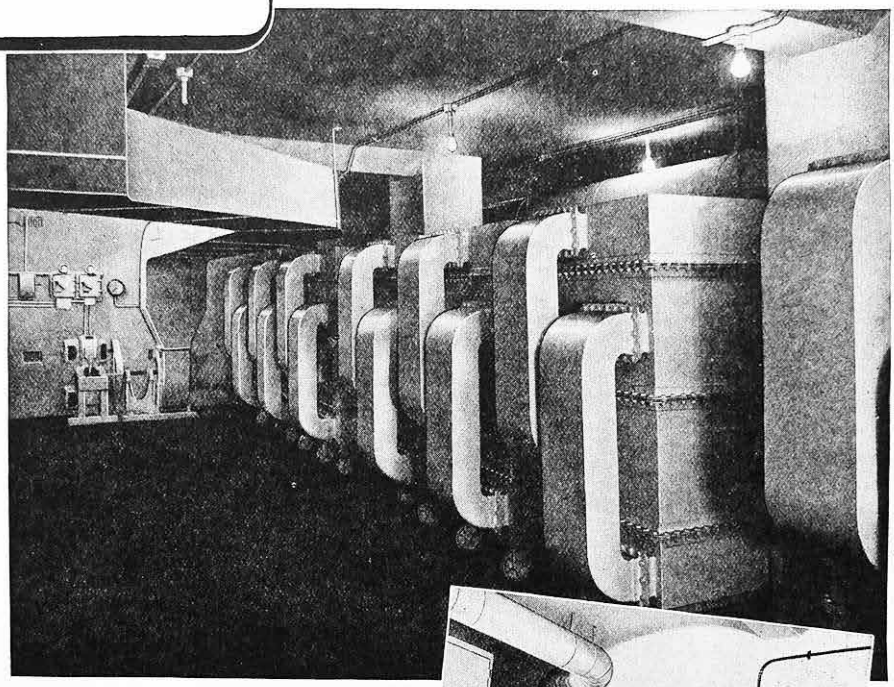
barrages and fighter protection, evolving into the London Air Defence Area. Some impromptu shelter provision was also made, reportedly in the use of suitable parts of existing buildings, with some limited new construction. It is not impossible that existing chalk tunnels on Thameside were designated for use as shelters. Certainly, new shelter tunnels were created in chalk in East Kent and at Chatham but more about this subject needs to be discovered.

The statement of the former (and future) Prime Minister Stanley Baldwin in 1932 that, in future wars, 'the bomber would always get through' and the subsequent perceived menace of German re-armament and expansion of her air force, engaged the thoughts of British politicians and defence planners. It was predicted that a future air war would start with heavy bombing of populations, military, industrial and infrastructural resources, intended to deliver an early and decisive knock-out blow in an attempt to compel surrender.

Carrier

GAS DEFENCE AIR FILTRATION SYSTEM

SHELTER VENTILATION has been installed by Carrier in Report Centres, First Aid Posts, Control Rooms, Buildings of H.M. Government, Colonial Governments, leading Railway Companies, Banks, local authorities and public utility undertakings.



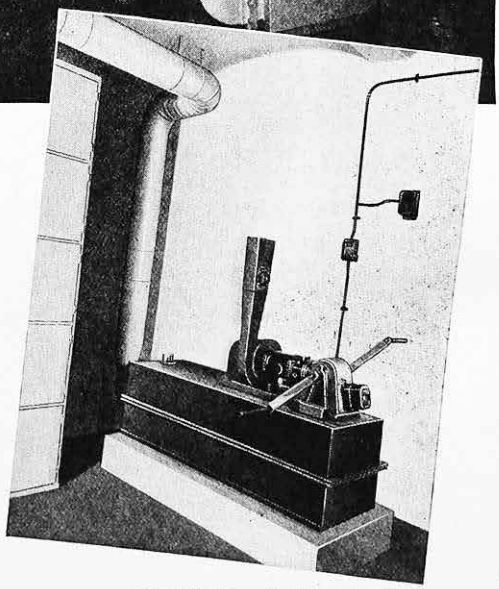
A large Carrier Air Filtration Plant installed in a London Bank.

The Carrier Units of 50 and 100 person capacity have passed all official tests and bear the Home Office Certification Mark, LICENCE No. 1.

Guaranteed protection is provided by the Carrier Air Filtration System against all poison gases. Smoke, the principal cause of panic in a shelter, is completely eliminated.

The Carrier System of Ventilation reduces the floor space required for any given number of persons, thus making a considerable reduction in the total cost of the shelter.

Write for Gas Defence Booklet No. 16.

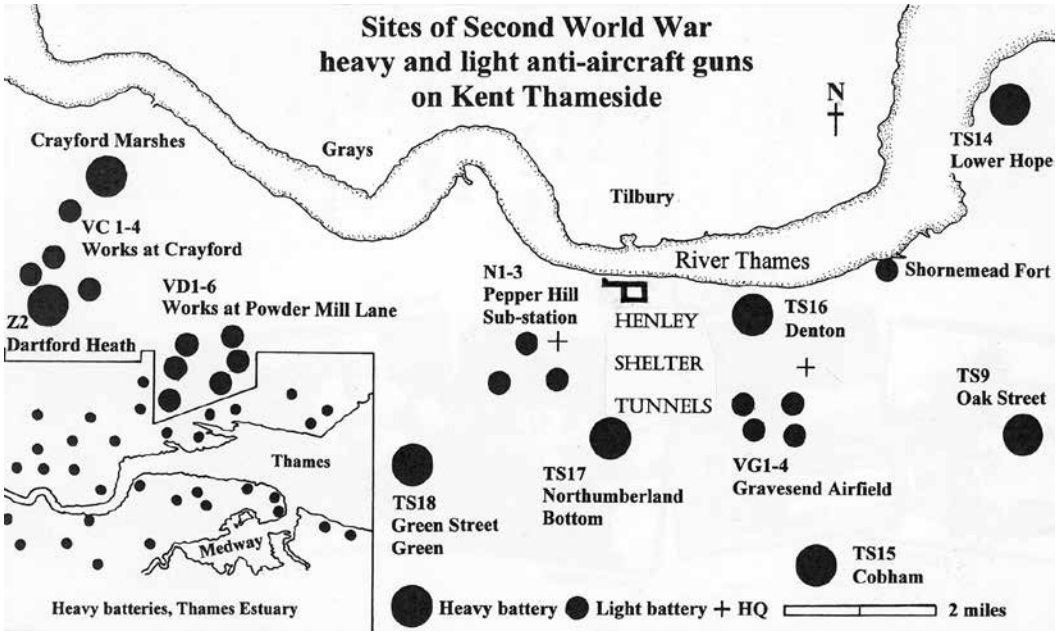


Installation of a Carrier Unit in a shelter for 100 persons.

Carrier Engineering Company Ltd

24 Buckingham Gate, London.

Advertisement from a supplier of gas defence air filtration systems for shelters, published in 1939



Map of the Second World War anti-aircraft gun sites on Kent Thameside. Drawn by Victor Smith 2009

Such concerns led to the Reorientation Scheme against Germany in 1934. This included two strands: first a strengthening of Britain's active air defences in the form of greater numbers of more modern military aircraft and a scheme for gun defence on the ground, including Kent Thameside becoming part of a projected – and later implemented – Thames and Medway Gun Defended Area; second, there were enhanced efforts, taken forward in 1935, by a new department at the Home Office, to achieve effective measures of civil defence.

Initially, and for about two years or so, the latter was attempted by means of promotion and persuasion but this came to be succeeded by statutory requirements. In consequence, protective measures began to be introduced in the community in the form of groups of organized personnel and volunteers, who would be brought into action shortly before, during and after air raids, and who were to operate from a network of warden, first aid, fire and rescue centres. Control centres were to provide coordination of these assets and of the civil defence response. Measures were also to include industry. Nevertheless, preparations in Britain were said to have been more than matched by those of other countries, such as France, Germany and Soviet Russia.

The concurrent example of death and destruction from air bombing during the Spanish Civil War served only to increase the perceived urgency for civil defence preparedness. Not least did this provoke the appearance of the influential book *ARP* by J B S Haldane in 1938. The use of poison gas as a weapon of war had been suggested in the nineteenth century and featured in the stories of H G Wells. The memory of its actual use on the Western Front during the Great War and knowledge of its recent employment from the air in 1935 by the Italians in Ethiopia, and in 1937 by the Japanese in China, had additionally focused the minds of defence planners.

Government had begun to consult with industry and representatives of national infrastructure in 1936 and to issue guidance for shelter provision in these sectors, such as 'Air Raid Precautions in Factories and Business Premises'. Initially there was a somewhat muted response in taking first definite steps, although it is known that some companies such as I.C.I, Boots and Harris Lebus did so. The owners and management of the Henley factory would have been a typical candidate for such consultation but there is no surviving record of this. Haldane criticized government guidance, following the Civil Defence Act of 1937, as being 'beautifully vague'.

The scare of the Munich Crisis in 1938 drove a determination to do more. Government became more assertive in its Act of 1939. A requirement for civil defence and, in phases sheltering, whether for industry or for the population, was of course as much about ensuring national resilience in war as being humanitarian in intent. Air-raid precautions increasingly became a preoccupation of architects and engineers as well as of commercial companies intending to benefit from new business opportunities. Their articles in journals and booklets, supplementing and reinforcing the guidance of government, are a window into contemporary thinking.

Immediate origins

Under the Act of 1939 measures for air-raid precautions in industry became mandatory, so that workers could expect – by law – the provision of protection from those by whom they were employed. A code of that year set out a standard of protection. As described elsewhere, measures were to secure against blast, splinters and debris but, in general, not against a direct hit. The resistance of various types of material against bombing was set out.

Henley at Northfleet had become an important specialist industrial centre. This grew out of the emergence of the Age of Electricity, being chiefly a manufacturer of electric cables, distribution equipment, connection boxes and of insulating materials. Following its beginnings elsewhere in the previous century the company had expanded in 1903 to buy land for a new factory north of Crete Hall Road in Northfleet. This grew in size in 1910 and 1926, as well as in 1939, on ground previously the famous Rosherville Gardens, on the south side of the road. By then the works had also been producing rubber vehicle tyres for nearly twenty years.

Postcard, c. 1906, showing part of the former Rosherville Gardens in front of the cliff face, later tunnelled into to create the Henley shelter complex

Premises, such as Henley's, with more than fifty staff were required to have shelters for the staff who worked within them, a policy from 1936 for them to be sent home in the event of an air raid having been recognized as impracticable. Standards of protection, which included those of anti-gas filtration plant, were laid down in ARP guidance and Codes. For Henley's, and for the county of Kent, technical advice, if required, was available from specialists at the Home Office in Westminster. Costs were to be defrayed against the claim of a government grant and factories were required to provide progress reports by August 1939. Factory inspectors were empowered to carry out monitoring visits.

The shores of the Thames below London were recognized as containing vital industries and national assets. Within that, and including Henley's, the Northfleet parts of Kent Thameside were the home of important other industries and facilities such as Bevan's Cement Works, Bowater's paper factory and other paper suppliers, as well as the Red Lion manufacturing and repair wharf. In a bombing risk assessment map of April 1939, Kent Thameside was given the highest category of bombing vulnerability and priority for shelters.

The Act was a signal for industry to consider urgently what it needed to do. Henley's must have acted quickly with planning and preparation of a design because cutting of the tunnels was reported in early 1939 to be imminent and appears to have been underway by June, the time to completion being later reported to have been 'about 10 months'. Government felt a need to define the meaning of an air-raid shelter and, in its Code of August 1939, did so by explaining that this was a means of 'protection otherwise than by war-like means…from hostile attack from the air…'

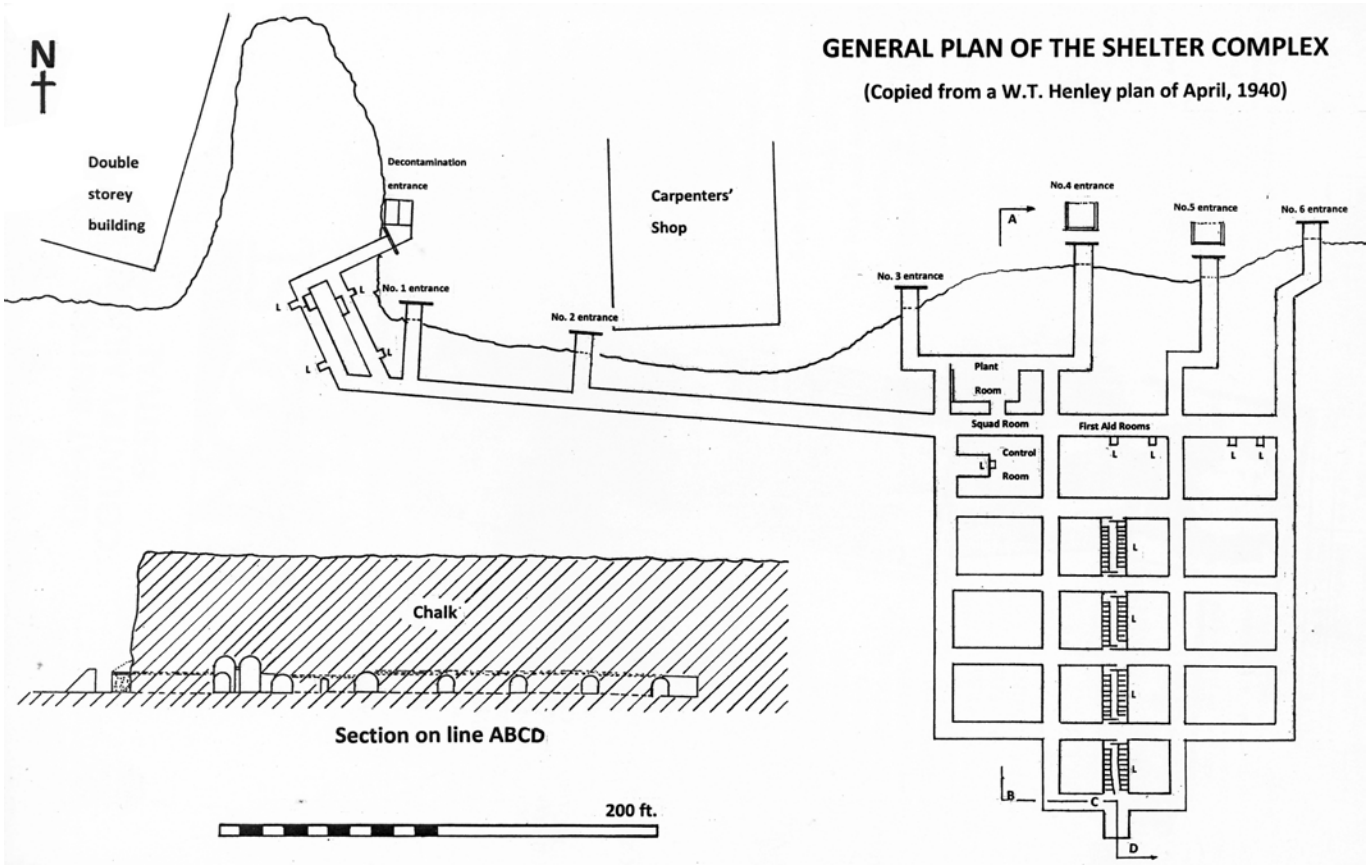
There were other tunnel shelters as well as surface shelters nearby, for the personnel of Northfleet and Swanscombe cement works with sundry surface shelters for the local factories, and further tunnels for civilian, and perhaps some industrial users, under The Hill at Northfleet and elsewhere. Regional Commissioners had power to coordinate civil defence in their designated areas across the country, the Henley site coming within Region 12, which covered Kent and Sussex and whose headquarters were at Tunbridge Wells.

Design

As recorded in a plan by W.T. Henley of April 1940, the complex is on a rectilinear grid-iron plan. A drawing made by Gravesham Borough Council in a recent rendering of a plan apparently dated March 1941, shows an almost identical layout.

Part of a bombing risk assessment map of April 1939, including the part of Thameside in which the Henley tunnels were located

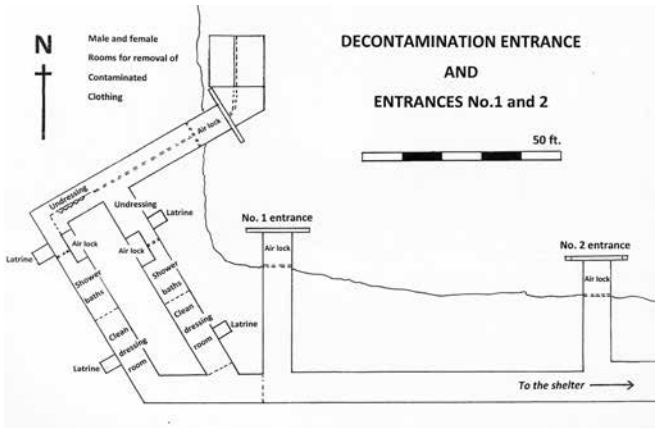
The plan of the complex was one of a number of contemporary design approaches dating from 1936 for the layout of a large-capacity refuge. The chalk overhead provided ample protection and shock absorption from the landing and explosion of bombs, the semi-circular arching of the tunnel being resistant to downward forces. The white-painted internal skin of 6-in of reinforced concrete applied to the walls and arch was a lining to the chalk. Shuttering marks may be seen. The floors, of



A copy of an April 1940 W.T. Henley plan of the shelter complex. Drawn by Victor Smith 2021

varying quality, were either concrete or compacted stone laid in mortar.

Within a short walking or running distance from the factory, the shelter was accessed through six gas-proof entrances/exits in the chalk cliff face. Post-demolition traces remain. Each had outer doors and inner ones, forming an air lock, which best design practice prescribed. There are surviving doors in steel plate. At least two of the entrances appear to have been fronted by blast walls.



Enlargement of the decontamination entrance as shown in the W.T. Henley plan of April 1940. Drawn by Victor Smith 2021

Moreover, and following the approach adopted elsewhere, the angled entrance passages reduced the effects on shelterers of an otherwise unrestricted blast-wave from a bomb exploding at factory level outside. There was a seventh special decontamination entrance with similar protection. In keeping with other very capacious shelters, the number of entrances had to be adequate to ensure unimpeded transit of the large numbers of people expected to enter and leave the shelter at the same time. Entry was required within seven minutes of a warning having been given.

Fear of gas attack

The decontamination entrance and two of the others gave access to a communications tunnel (or travel gallery as it was officially called) and which led into the shelter area. The other four entrances led more directly into the latter. The decontamination entrance is shown as having a projecting entrance structure in the plan of 1940 but the plan of March 1941 does not. Demolition of this area has removed the evidence and air photographs and maps are unclear. In either case, and as is evident today, it was divided into separate areas, with disrobing rooms for women or men who might have been contaminated in the event of an attack with chemical weapons.

There were cleansing showers, first aid and dressing rooms, stores of replacement clothing being held ready. Scales of equipment and supplies for a decontamination facility were laid down, including bins for contaminated clothing, anti-gas ointment, bleach paste, soap and towels, eye douches and distemper brushes. Within the shelter grid was a command post or control room, linked by telephone to protected outside observers who would report the situation during and after a raid, advising when it was safe for the shelterers to leave and, if possible, return to work.

The air conditioning plant room in 2007. Photo Ed Combes

One of the outside posts for observation was a blockhouse on a cliff overlooking the factory. This was reached by scaling the 110 rungs of three ladders lashed together and pitched sheer up the cliff face. There was also the nearby staircase to the cliff top from the Rosherville Gardens days but it is unclear whether this was accessible at the time.

Inside the shelter there were also first-aid rooms and a room for shelter wardens and others, apparently made by dividing a passage with temporary partitions. Latrines were provided. Official guidance was for there to be an equal balance of plumbed-in toilets and chemical ones but the Henley tunnels appear to have had mainly chemical, utilizing Elsan buckets.

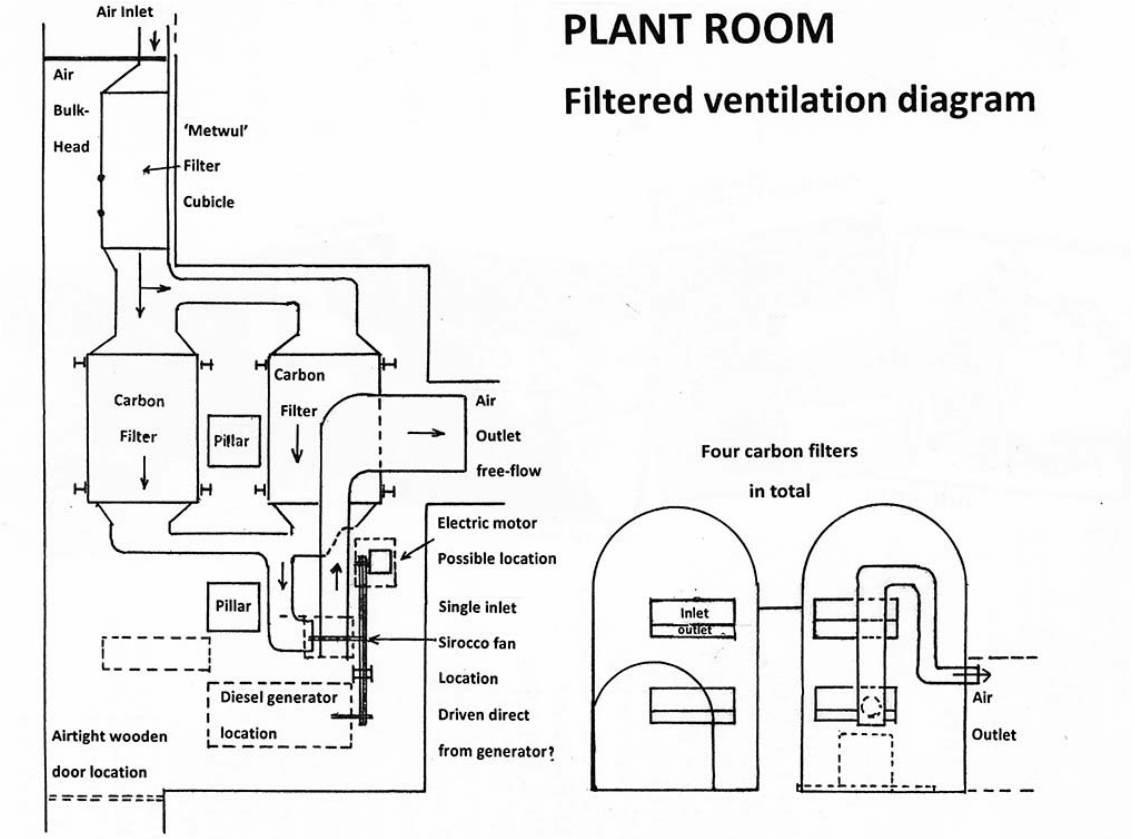
According to the plans of 1940, these were provided on either side of a central latrine tunnel, in individual cubicles. Although a large number of Elsans are to be seen today, there is no trace of cubicles, unless they were of light, portable form. There is perhaps a sense that the arrangement to be seen today might, in some details, not entirely reflect that shown in the plans. Recesses for Elsans may be found in the decontamination entrance, the first-aid and squad rooms and in the control room. Pipework for water may be seen in various places, including at the northern end of the central latrine tunnel (possibly indicating the former presence of a handbasin). There is a waste water gulley under the floor nearby.

Essential ventilation

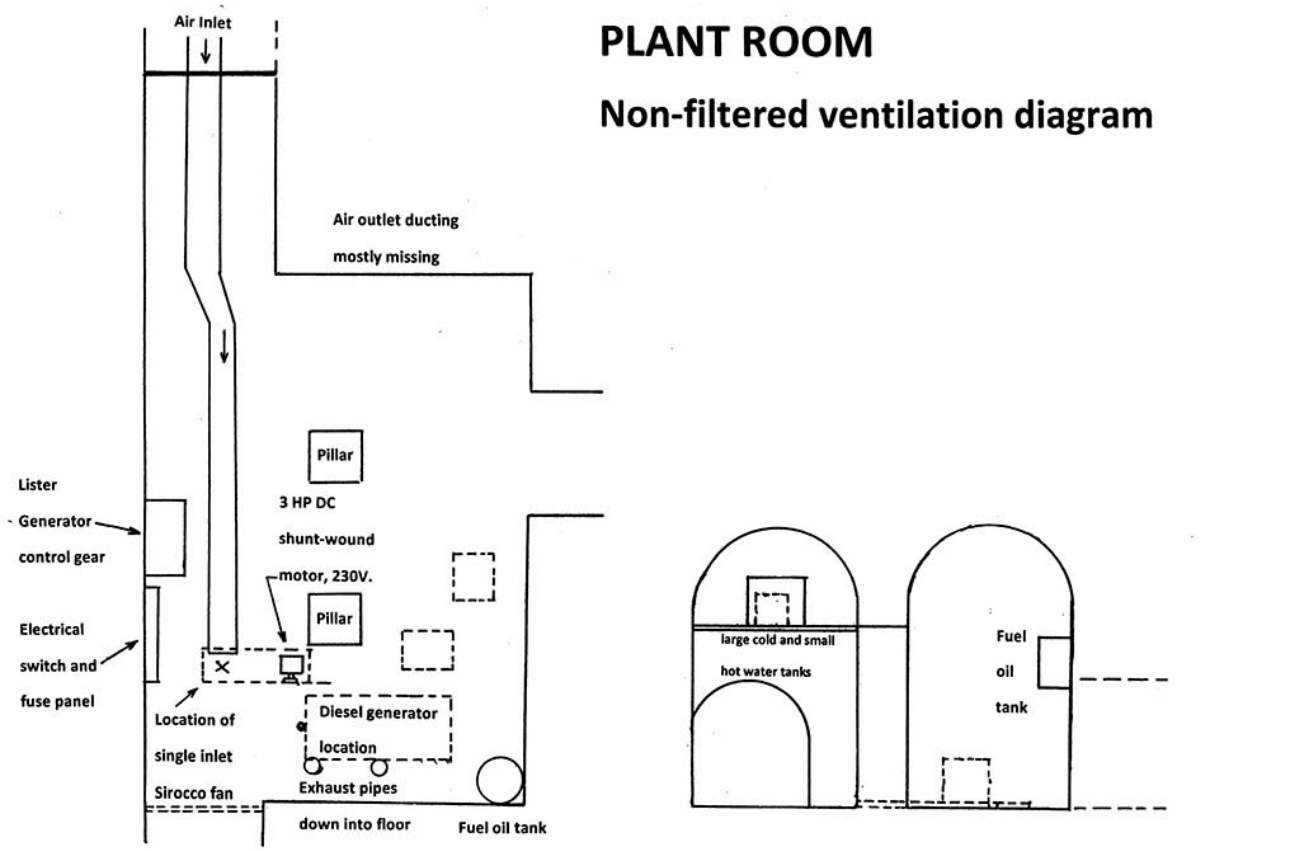
Safe breathing of the air within the shelter was achieved by the provision of ventilation and gas filtration, powered from an internal engine or plant room. The equipment concerned was a mechanical science in itself and manufacturers offered a selection of types. As a general rule, the larger the shelter the larger the required equipment. Indeed, the Henley engine room was, in effect, two-storied in height, containing generating plant to (a) power air movement and filtering systems to prevent the entry of war gases, and (b) to provide a stand-by supply of electricity for lighting, the public mains being used pending its disruption or failure. Both bare and conduit-mounted cables were connected to a succession of exposed light bulbs.

It was recommended for such shelters that electric torches be kept ready in the event of failure of both the mains supply and the standby set. Ventilation was by forced draught, the air being drawn in from the outside, where traces of intakes may be seen, to be passed through the anti-gas filtration equipment and circulated through the tunnels by ducts, of which traces remain. The air was reported to have been changed every sixteen minutes.

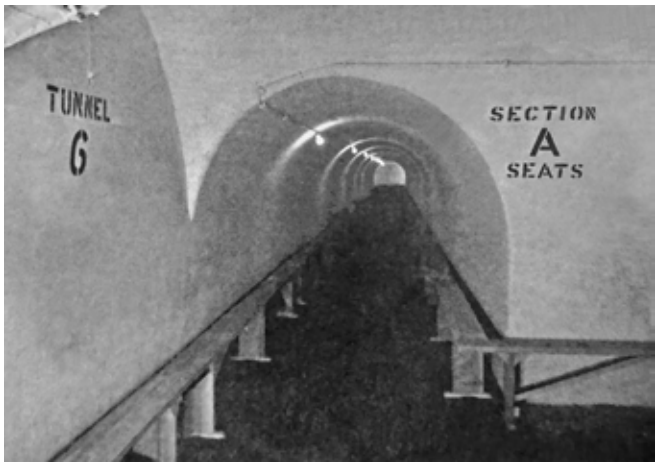
Paul Thorne examined and commented on this plant in 2003, noting that there appear to have been two independent



Plant room diagram (filtered ventilation). From a drawing by Paul Thorne



Plant room diagram (non-filtered ventilation). From a drawing by Paul Thorne

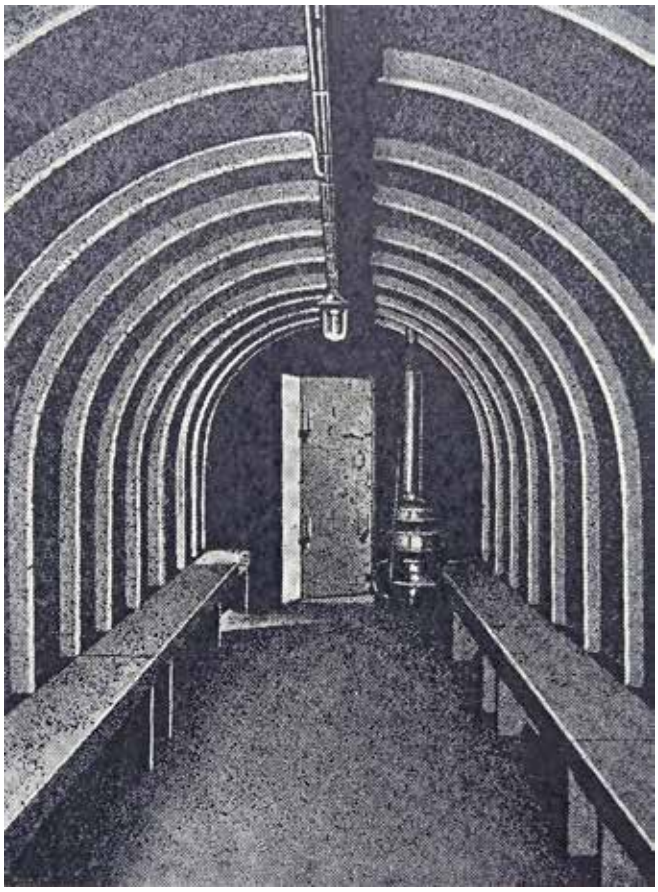


Seating in the shelter during the wartime period

ventilation circuits, one with two-stage filtration and the other without. Neither could run unless the generating set was also operating. One seems to have been mechanically driven by a (now missing) diesel engine, whilst the other needed Direct Current power to run its motor, and only a DC generator could provide this. Either fan would positively pressurize the main cross tunnel, thus expelling air at all the entrances except the one (No. 3) containing twin air intakes.

Paul Thorne has added that 'a changeover switch would have allowed the tunnel lights to be switched from external mains AC or DC generator, both at 230V. But either fan drive would be run entirely off the generator engine, either directly, or via a DC generator to run the DC motor.'

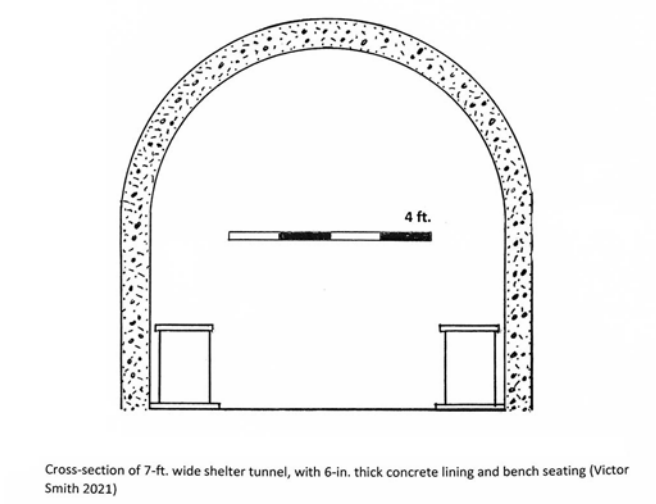
The 7-ft wide tunnels had moveable bench-seating along either wall, with further seating along the centre of the larger 10-ft wide ones, as marked in lettering on the walls.



Advertising photograph by the Allen Company showing typical bench seating, 1939

This consisted of horizontal wooden planking resting on vertical boards at intervals, in turn fixed into transverse floor bearers. This was one of a number of typical seating

designs for shelters, something similar being shown, for example, in an advertising photograph of the Allen's company. There was extensive painted directional and other signage throughout to help guide the shelterers as they entered, so avoiding confusion and congestion.



Cross-section of 7-ft. wide shelter tunnel, with 6-in. thick concrete lining and bench seating (Victor Smith 2021)

Cross-section of one of the 7-ft. wide tunnels. Drawn by Victor Smith 2021

Each shelterer was given a card identifying their reserved seating. There is no evidence of there having been provision for sleeping spaces, although if need be, these could have been extemporized. The 14 ft x 10 ft room at the centre of the southern extremity of the tunnel system may have been designated as a strongroom for storage of company and factory records.

Tight seating

Legal requirements were for the capacity of a shelter to be that of the maximum number of employees and of any anticipated increase. A study of seat numbers painted on the tunnel walls suggests that there was provision for around 2,500 shelterers, each of whom would have had a planned seating space of 1ft 6in to 1ft 7in, a not untypical situation in other shelters and a generally expected minimum, which was to provide for ten people within a bench run of 15 ft.

Section of tunnel showing recess for Elsan chemical toilet in 2007. Photo Nick Combes

The shelter was contemporarily reported to have had capacity for 2,300 people, but that up to 3,000 could be accommodated in an emergency, presumably involving some use of space in the travel gallery. The same commentator remarked that 'This 2,500 feet tunnel system….was designed by the people at Gravesend Works [Henley's], the Holborn Construction Company being responsible for construction and concrete lining. Altogether, about 8,000 tons of chalk have been excavated. The entrances are built out from the cliff face as solid structures – a measure designed as a safeguard in the event of heavy falls of chalk from the cliff face….'

Intersection of tunnels in 2007. Photo Nick Combes

The chalk was taken out on skips running on rails while 'concrete, mixed in a mechanical mixer outside, was being brought in by another – similar to the transport system in a colliery.' It has been suggested that the initial stage of the digging out obliterated some grottoes which had been created for the earlier Rosherville Gardens, although the evidence for this is unknown.

Signage painted in black on the walls gave occupants directions to the first-aid rooms and to the designated seating spaces. Other signs stated that 'Smoking is strictly forbidden'. On the trunking in the plant room has been found pencilled 'To Hell with Hitler'. At the decontamination entrance are the words '534 Works Dep', of unknown date.

Travel Gallery in 2007. Photo Nick Combes

Importance of protecting Henley's workers

The attention given to the protection of Henley's workers was underscored by the factory being a key and strategic industrial site, whose role was crucial to the war effort in all its stages. Examples of Henley's increasingly diverse

Electrical box in passage in 2007. Photo Ed Combes

Inside of one of the entrances in 2007. Photo Ed Combes

and vital war-effort manufacturing were:

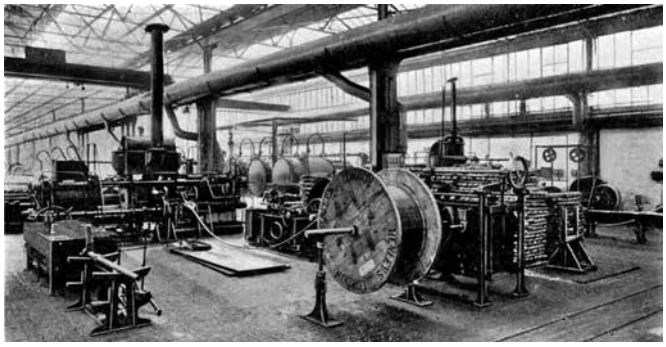
- 14 million gas masks for adults and half-million for babies
- Cables used on ships as a countermeasure against German magnetic sea mines
- Cables used offshore to detect and connect with explosives to destroy submarines
- Rubber tyres for military vehicles
- Ear defenders for soldiers
- Communication cables
- Millions of parts of artillery shells, mortar bombs, rocket firing apparatus, aircraft fuel tanks and small-arms ammunition
- For the liberation of Europe, the innovative Pipeline Under the Ocean (PLUTO), to supply fuel for the Allied armies once they had landed.

Working parties and others brought in from outside the factory could be called upon to clear rubble and debris in the event of bomb damage and to repair machinery. Civil defence teams were on hand to decontaminate the factory buildings in the event of an attack with gas.

The agent used might have been of a poisonous, irritant or blistering nature, whether of a persistent or non-persistent kind. Most, but not all, types of gas could be discovered by a range of special detector sheets around the factory

Manufacturing area at Henleys for PLUTO: Wartime photograph

Gas masks were also made at Henleys: Wartime photograph



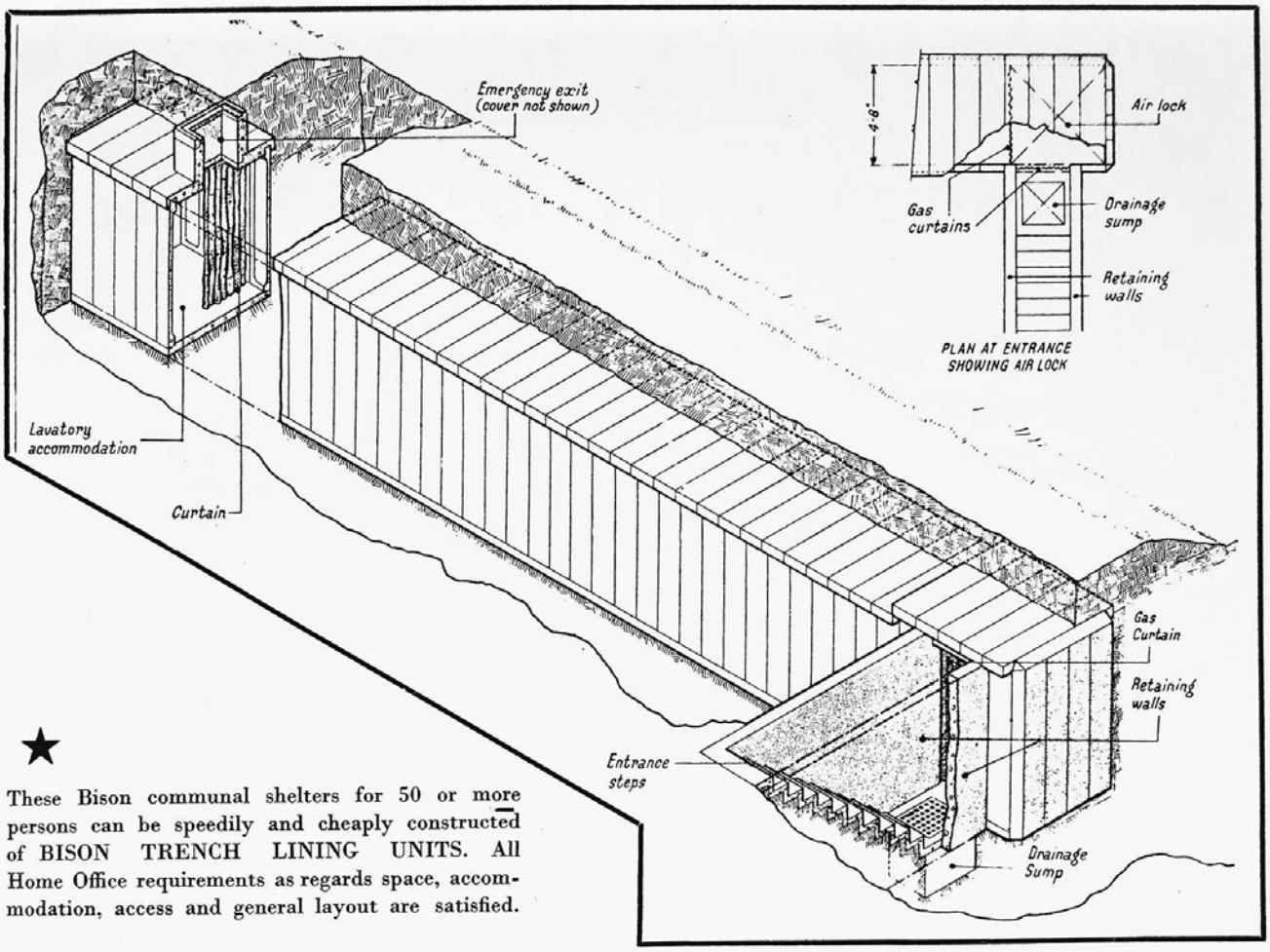
Lead press shop at Henleys

premises. Decontamination workers, who followed well-prepared procedures, had available to them a range of equipment and large stocks of bleach with which to treat surfaces. Rescue and first-aid detachments were similarly prepared and had a large supply of the plant and other things they needed.

Use of the shelter

No documents have yet come to light recording the frequency of the occupation of the shelter. The industries

BISON trench-type INDUSTRIAL SHELTERS



★

These Bison communal shelters for 50 or more persons can be speedily and cheaply constructed of BISON TRENCH LINING UNITS. All Home Office requirements as regards space, accommodation, access and general layout are satisfied.

BISON TRENCH LINING UNITS have been highly praised by independent observers for their exceptional strength, precision-like uniformity of shape and smooth finish. Constructed of vibrated concrete with welded reinforcement their total cost is low because the simplicity of the system and the ease of fixing saves time, and enables semi-skilled labour to be employed. The approximate delivery cost of a BISON INDUSTRIAL SHELTER for 50 persons is £45 exclusive of *in situ* work, doors, bunks, etc.

These shelters are semi-underground and additional protection can be secured by increasing the thickness of the covering of earth. The floor is formed *in situ* with poured concrete or can be formed of precast floor units if required.

The other BISON A.R.P. SYSTEMS

In addition to the BISON INDUSTRIAL SHELTER we have perfected various other types of shelters. Amongst these are the Bison Precast Household Shelter, the Bison Wattle Shelter, where wattle hurdling is both pleasing to the eye and forms an excellent key for rendering, the Bison Sunk Box-Type Shelter for private gardens, etc., where surface shelters are undesirable. Full details of all the Bison A.R.P. Systems are contained in our latest folder. A copy will be sent to you at once if you write or telephone to any of our offices.

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105 WEST REGENT STREET, GLASGOW (Douglas 2074).

An advertisement for another type of industrial shelter, similar to some other civilian types

of Northfleet on Thameside were a tempting target, but they did not receive quite the determined and focused bombing attention they merited. Anecdotally, Henley's was, however, bombed at least once, resulting in the sight of banknotes floating in the air from the inside of a damaged factory's pay office.

The theoretical procedure was for the employees, carrying their gas masks, to be evacuated into the shelter upon hearing an air-raid alert and then, as earlier mentioned, to return to their work places upon the notification of an all-clear and after a judgement had been made by a coordinator that it was safe to do so.

How often a factory evacuation and shelter occupation was practised is unknown. The hope and intention was for the occupation of the shelter to be accomplished promptly on receipt of a bombing alert and so shelterers would already be safely inside and protected should an attack include the use of poison gas.

In the event of the latter starting without warning, there might have been some confusion as the shelter began to be occupied and there are perhaps questions concerning the ability of the decontamination entrance to cope with a possibly large through-put of people. The number of combined entrances/exits was a pragmatic substitute for the provision of separate emergency exits.

Brick partition wall (right) in the tunnels in 2007. Photo Nick Combes

Henley Home Guard in 1941

Inside the shelters

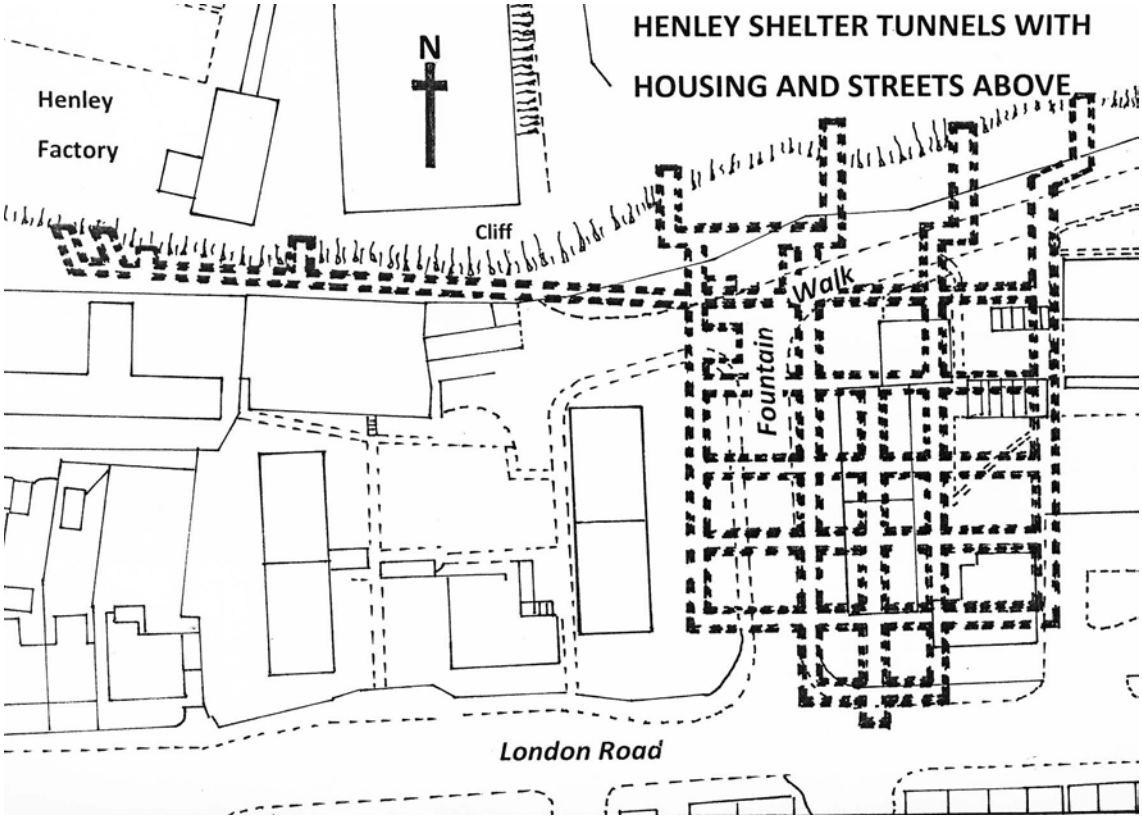
The gathering of people in communal shelters was a needful social phenomenon of the war, in this case of a specific group of people. What conversation took place in them is unknown. At times during shelter use there was, by report, some informal entertainment in the form of sing-along. Whether there was provision for the supply of drinks to shelterers is unknown. There is no evidence of there having been a kitchen.

Henley staff taking shelter in the tunnels at an unknown date, perhaps as a drill: Wartime photograph.

Air-raid alerts could hold up factory production. During the course of the war, there were 1,252 in Northfleet and Gravesend but how many of these resulted in cessation of work at Henley's and shelter occupation is not known. It may be that, as at some places elsewhere, a retreat to the shelter would not have taken place until bombing had actually started sufficiently close-by to be seen as an approaching threat. The walls of the shelter do not exhibit the marks of soiling or wear which might have been expected to result from frequent occupation.

Kent County Council's simplified characterization of the air war in their report of 1946 was of a period of comparative lull from 3 September 1939 to August 1940; greater activity during August 1940 – August 1941 (during which time the Battle of Britain took place, when there were many overflights of the area); a second lull from August 1941 to January 1943; sporadic raiding from January to April 1943 and the V1/V2 attacks from June 1944 to March 1945.

Henley's North Woolwich works in the dockland district of London suffered repeatedly from heavy air raids resulting in death, injuries and destruction of buildings and plant. As Henley's at Northfleet 'had fared better in the raids', it was decided to transfer some manufacturing there.



Map with the shelter superimposed on the layout of post-war housing and roads, after an undated Henley plan. Drawn by Victor Smith 2021

Postwar uses

As for shelters everywhere, use of the Henley complex ceased with, or rather shortly before, the end of the war. It might have been a candidate in the early Cold War for inclusion in a national list of shelter assets for possible future utilisation. Indeed, it was briefly considered as a candidate for adaptation of part of the tunnels as a local Civil Defence Control Centre but the final choice lay elsewhere.

Large shelter for Vickers Armstrong workers at Weybridge, Surrey. The now sealed shelter is located at the rear of the car park for the David Lloyd health club at Brooklands. Evidence of later production is seen in one of the shelter tunnels in 1999. Wartime signage is seen on the end wall. Photo Nick Catford

In 1959 Henley's was acquired by Associated Electrical Industries, then in turn by the General Electric Company in 1967, and renamed GEC Henley. It has been reported to the writer that in 1975, if not earlier, the tunnels were used

The Littlewoods Pools building in Liverpool was used for the manufacture of Halifax Bombers during the war. A large shelter complex was constructed by cut and cover for workers to one side of the factory. When specially opened for members of Sub Brit in October 2012, the tunnels were still in good condition but only wartime graffiti remained to be seen. Photo Nick Catford

as an extension to the Engineering Drawing Department of the factory, having draughtsmen working at drawing boards. This was not a conducive environment for such work and would have required adequate lighting.

By this date, the outcrop of chalk containing the decontamination entrance had been demolished. The tunnels were subsequently, and until the later 1980s, an assembly area for Special Accessories, in the main, products for the offshore oil industry. In time, some of the tunnels became a repository for a variety of discarded scientific and laboratory equipment from the factory. Some factory records were also kept inside, including papers from the 1950s.

The eastern end of the tunnel complex was partitioned in brick during the postwar period, presumably in support of some of these activities. Some of the timber flooring in evidence might have originated at this time. Also, at an uncertain date in the postwar years, the internal air-lock doors were removed and outer doors and entrance facades altered. In 1997 the company was taken over by TT Electronics in 1997 and, in 2010, by Groupe Sicame.

Housing development

In the first few years after 2000 the Henley factory site became earmarked for future development and the contents of the tunnels were subsequently removed. Following gradual clearance of the factory buildings, not complete until fairly recently, the ground in front of the entrances to the shelter entrances was raised from the deposition of material excavated from the London Crossrail project. After settling, this became the site for construction of housing by Keepmoat Homes, at present (2022) in progress.

One of the entrances to the shelter complex at Henleys in 2021. Photo Victor Smith

The remnants of the decontamination entrance at Henleys in 2021. Photo Victor Smith

Because it is below the housing of Fountain Walk and associated land, which are in the ownership of Gravesham Borough Council, the shelter is owned by the latter which, for safety reasons, maintains the cliff faces and has covered them with wire mesh against falls. The approaches to the cliffs and tunnel entrances across the development site are in other ownership.

Other types of wartime shelters

Just as surviving pillboxes symbolise Britain's anti-invasion defences during the Second World War, so air-raid shelters define the years-long imperative to provide passive protection against the threat and reality of bombing from the air. Many thousands of shelters were built across the country. Such protection varied widely from use of basements, strengthened or otherwise, to small designed private shelters next to (or within) homes. These were the 'Anderson' and the 'Morrison' shelters, provided free or sometimes bought from government via local authorities, added to which were communal shelters for the public, industry and for service personnel. The latter three categories could be surface, semi-surface, blockhouses inside buildings or underground, whether in freshly tunnelled spaces or the adaptation of existing ones.

Control Room at Henleys in 2021. Photo Victor Smith

Industrial shelters had the same basic frame of reference for design as for most of the other types. Contrasting with Henley's shelters at Northfleet, some were used for the protection of production, such as at the Carrow Works complex in Norwich. This had a similar layout but was smaller in extent. The vulnerability of the Plessey factory in Ilford led to the transfer of manufacturing to future Central line tube tunnels nearby. Some aviation production of Short Brothers took place in chalk tunnels in the hillside at Rochester, not far from Thameside.

Some shelters for workers were built into the design of the buildings of recently-constructed factories, such as at Park Works, Kingston-upon-Thames and elsewhere. Blockhouses were sometimes used as shelters inside factory working areas, exemplified in the wartime motion picture *Millions Like Us* (1943). Henley's North Woolwich factory had no space for underground shelters so it used strengthened ground-floor areas as refuges.

Another example of shelters for a large number of workers comparable with Henley's was the complex for the Ekko factory in Essex, although this was cut-and-

The eastern opening to the air conditioning plant room (right), with a turning in the tunnel to the left to the shelter spaces and the first aid room in 2007. Photo Nick Combes

cover in fields close to production. A network of shelters for workers at the Courtauld factory at Halstead, Essex is featured on page 86 of this issue of *Subterranea*. The exposed quarried chalk faces along the riverine parts of Northfleet and Kent Thameside had offered ideal points of entry for the creation of tunnel air-raid shelters, for the protection of both industrial workers and civilians. Some of the tunnels selected for use as shelters already existed as communications between riverside works and nearby chalk quarries, only needing to be adapted or extended.

In these categories, west of Henley's was a possible tunnel behind Bowaters, and as previously mentioned five tunnels under The Hill at Northfleet, several at the Northfleet cement works, others in rear of similar works at Swanscombe as well as at Greenhithe but these were not of the same regular design and scale as those for Henley's. Elsewhere in the county of Kent were the tunnel shelters in Chislehurst Caves, at Ramsgate, at Dover and, as mentioned above, Rochester. There were others in South Essex. New large tunnel shelters were also proposed for a number of major inland urban locations in Kent but these were not proceeded with.

Elsan buckets in one of the tunnels in 2007. Photo Nick Combes

Bunker mentality

As exemplified by the use of the London's tube tunnels and platforms, protection in places deep underground could instill in people a soothing sense of security, usually justified by the resistant qualities of a thick protective overburden. Indeed, concerns were expressed at one stage that shelterers at Ramsgate and elsewhere might become reluctant to come out again.

Vertically, the Henley tunnels fulfilled the official definition of a 'Deep Shelter', in which shelterers were officially regarded as being in no danger from bomb-induced concussion. Their entrances were, of course, at factory level, at risk from bombing and horizontal blast but, as earlier suggested, it was presumably considered that the effects of the angled entrance passages to the shelter areas and the barrier of chalk were sufficient protection.

As commented in a report by CGMS, 'in terms of national significance, the complex at Northfleet is mentioned explicitly within Historic England Guidance (2016) on civil defence structures as a surviving example of underground World War Two industrial air-raid shelters. Indeed, the county of Kent is noted for this and one other shelter of a similar type [the Shorts tunnels at Rochester], indicating a degree of national and regional significance…..' and, as noted within Historic England Guidance, the painted signage found within the tunnels at Northfleet 'adds markedly to the historic interest of a civil defence structure. This contributes to the significance of the site due to the rare nature of this signage in other air-raid shelters of this type, and indeed of other types, that survives.'

The tunnel seen from entrance 4 in 2007, with a no-longer present wooden door of unknown date and ventilation trunking above. Photo Nick Combes

Despite the mutilation of its entrances – especially regrettable in the case of the decontamination area – the complex is noteworthy for its large size and the completeness of its layout, representing an historically ideal template for design. The remaining machinery in the plant room exemplifies the technology of its age. It is a scarce surviving example of its type in the southeast of England. Its importance is underscored by its relationship with key Thameside industry, symbolizing a crucial national industrial effort during a most challenging period of world war.

These factors argue for consideration to be given to its statutory protection. Its entrances should be secured against intrusion and the carrying out of damage, already evident in the presence on the walls of painted graffiti.

Looking south along Tunnel 3 in 2007. Tunnels 3 - 6 are parallel with each other and are linked by cross passages which are seen on the left. The tunnel to the right leads to the decontamination entrance and entrances 1 and 2. Photo Nick Combes

Necessary conservation measures

A road under the cliff has been retained and security-fenced in order to provide access to Gravesham Borough Council for the purpose of external maintenance to guard against chalk falls. An electrical pillar has been offered by the developer to allow for the possibility of introducing an electrical installation inside. There is gated access to the road from a route across the development.

In this writer's opinion, and after the implementation of safety works, the tunnels are of sufficient historic interest to lend themselves to occasional public access via guided tours of selected areas, with suitable interpretation and display of related artefacts. The size and layout of the tunnels might offer the possibility of income-generating reuse, especially for storage, at the same time safeguarding their historical features. It is understood that the developer will be providing external interpretation of the tunnels.

One of the sealed tunnel entrances in 2007. Photo Nick Combes

Acknowledgements and thanks

I must thank Rod Le Gear and Paul Thorne of the Kent Underground Research Group for their participation with Thames Defence Heritage in a survey of the tunnels in 2003/4 and for their supply of notes afterwards. Robert Hall generously shared his notes, following a visit he made with

Looking north along Tunnel 3 in 2007; cross tunnels are seen to the left. Photo Nick Combes

KURG in 2016. The former Associated Electrical Industries and Groupe Sicame kindly facilitated visits to the tunnels at various dates and, most recently, Keepmoat Homes for visits by the writer in 2021 and 2022.

Historical information and suggestions were gratefully received from Wayne Cocroft, Jay Curtis, the late Ken McGoverin, David Neale, David Oliver, Roger Thomas and Paul Thorne. Reports by Kayley Page and her team in drawing attention to insecure places of entry to the tunnels and to the ingress of slurry from the outside were important in leading to remedial action being taken by the developer.

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Reporting the ROC: 'Tocsin Bang'

Twenty years on, how we produced a documentary about the volunteers who would have been among the first to know if WW3 had reached the UK

David Wakefield and Andrew Denyer

Recording interviews "in the field": Joe James at The Lizard post. Photo Lawrence Holmes

As the decade which had begun with the unexpected thawing of East/West tensions started to draw to a close in 1999, two (relatively) fresh-faced members of Subterranea Britannica began to mull the idea of highlighting a hitherto little-known and often under-appreciated part of the UK's contribution to the Cold War effort.

The Royal Observer Corps - and its UKWMO parent – had proven to be of great interest to both of us, not least because of the sheer abundance of its remaining infrastructure still extant throughout the British Isles.

Indeed, some eight or nine years after the organisation was stood down following John Major's government's infamous '*Options For Change*' defence review of the UK's commitments at the ending of the Cold War, the country could still boast the majority of its shuttered 1560 or so underground monitoring posts as well as a considerable number of the much larger Group and Sector HQ installations.

It seemed to us that we were possibly now free to pull the metaphorical sheets from over our heads and actually take a look at what had been going on – almost literally – under our feet during those preceding years.

The early days

In our early years of Sub Brit membership, the website with its seemingly unending gazetteer of intriguing and enticing sites was a virtual Aladdin's cave, and nestling in the midst of the site reports were the regularly updated and ever-expanding number of reports on Royal Observer Corps monitoring posts being visited by the intrepid Nick Catford.

Often accompanied by his volunteer band of those willing to share the driving, whole swathes of the country were being covered as – map in one hand, a copy of Derek Wood's seminal *Attack Warning Red* in the other – the fate of the remaining estate of three-man concrete outposts of the erstwhile United Kingdom Warning and Monitoring Organisation (UKWMO) was documented and the

results eagerly fallen upon by those who, like us, shared a fascination for these prolific yet curiously overlooked compact subterranean refuges.

Realising that so many of these posts were readily accessible to us, and subsequently equipped with an AbeBooks-supplied new-old-stock copy of the aforementioned *Attack Warning Red* (later to become referred to by us both as 'The Bible'), Andrew and I started plotting out the locations of the posts visited thus far by Nick and Co which were within relatively easy striking distance of our respective Surrey homes.

Farnham post. Nothing much to see other than the original fence!

Initially, we were somewhat disappointed to learn that the sites closest to us had long since been done away with, including the original prototype post at Farnham just up the road, but as we looked slightly further afield, we were encouraged to see that there were plenty that were still intact and so we set about making it our business to go and bag a few.

Discovering one of our more local posts, Petworth

Now, in this day and age of Google Maps, commonplace satellite navigation and personal computers masquerading as pocket telephones, it's probably worth mentioning that our research was somewhat more primitive back then. Even so, armed with OS maps, print-outs of SB site reports and the grid references of ROC posts which looked like good propositions, we'd enter the coordinates into the then cutting-edge handheld Garmin GPS unit and most weekends would meet up and head off into the countryside. Watching the little target symbol on the Garmin's LCD screen getting closer and closer, we homed in – initially on four wheels, then by foot – on our prey.

It became very clear that the accessibility of posts varied enormously! Some, such as Billingshurst and Weybridge, you only had to open the car door and you were there. Others, including Clandon and Oxshott were tantalisingly visible in fields that didn't appear to invite visitors.

Decision to document ROC history

And so, after a good few enjoyable weekends charging around the south of the country, 'bagging' posts and becoming better acquainted with the ROC's history, we determined that it would be *A Good Thing* if we were to try and tell the truly remarkable story of the organisation and its volunteer members.

Telling *their* story was going to be key – putting a human face onto the physical infrastructure and really trying to get at what it was that motivated them to undertake a task that most others might reasonably run a mile from. Of course, *finding* these people to talk to was going to be number one on the list of pre-production tasks!

We decided quite early on that a video documentary of some sort would be the ideal as both of us have worked in television and the media since the outset of our relative careers, and this therefore was where we could apply our joint experience to best effect.

But, what to call it? What title could we give our fledgling production which might convey the ROC's vital role in informing the nation that its worst fears had been realised?

One phrase in *Attack Warning Red* leapt out at us:

'TOCSIN BANG'

This was the Group HQ-originated codeword reporting an electronically-detected nuclear burst and seemed to us to be – as no doubt intended by its original author – as arresting a phrase as any one might expect to hear in the throes of a nuclear war.

Tocsin Bang it was.

We continued to discuss the form this film might take, yet from the outset we knew that we needed to speak with the expert, and so it was that we found ourselves heading to a small pub on the outskirts of Swanley on a drizzly weekday early in the new millenium for a chat with the man in the know – Nick Catford.

As suspected, Nick proved to be the fount of knowledge we knew he would be, and pointed us in the direction of a number of people we were to become very close to as the project progressed.

Contacting former members

We knew that we wanted those who had served in the Corps to be the ones to tell us about what they had done and what had motivated them to do so, so we began putting out feelers to museums, old pals networks and the like, as well as to former members of the Corps who

had been tipped off as to our interest and who generously offered us access to their knowledge, collections and archives. With email not as ubiquitous as it is today, many letters were written and posted, and replies came in with a Royal Mail stamp rather than a ping on the mobile.

Having visited Newhaven Fort, and spending some time absorbing the information on display, we were fortunate enough to be put in touch with the indefatigable band of volunteer former members of ROC Number 2 Group. Most Tuesdays, these worthies gathered in a couple of the fort's Victorian casemates to curate their story. They had assembled a veritable treasure trove of artefacts, retrieved/rescued in the main from the Group/Sector HQ building in Horsham as well as from a number of the posts which reported to it.

Denise Chapman recorded in the ROC Cold War display at Newhaven Fort

Chief amongst their number, and two of the first people we wrote to, were the husband and wife team of Denise and Philip Chapman whose wartime service in the Corps had continued – proudly unbroken – through to stand-down in 1991. A constant source of knowledge and never once tiring of our continual questions, they, along with their close-knit band of former Observers at the fort, were rightly proud of their service and gave us every support we could have asked for, as did, it must be said, pretty much everyone else we approached for assistance with our project.

The "esprit de corps" (of the Corps), and the Observers' "comradeship" was mentioned by many throughout the production process and was repeatedly demonstrated by those we came into contact with. In fact, whilst making both documentaries, the number of former ROC staff and volunteers we encountered directly or indirectly who then went out of their way to assist us was remarkable, including our contact at the Crown Copyright Office who, as a former Observer himself, gave us every encouragement he could – a most useful ally and one we appreciated.

Before too long, we had arranged a series of interviews and filming days up and down the country with some of the most highly regarded and authoritative voices on the role played by the Royal Observer Corps… Those who were there.

Ranging from Observers both junior and senior, and right up to a former Commandant, the sheer spectrum of those who had staffed the Royal Observer Corps in its Cold War iteration would mean that we wouldn't want for input when the time came to point cameras and microphones in their direction.

Sub Brit's Nick Catford, whose mammoth survey had started us off down this road and whose own father had served in the Corps, agreed to take part in front of the camera, and pleasingly, we had also been able to line up a couple of Observers from within Sub Brit's own ranks who we knew should be able to give us a unique insight into the work they had undertaken. One of them, the much-missed Terry Wiseman, could also claim experience of work with the Civil Defence organisation, adding further to the greater picture of the UK's overall preparedness on the Cold War home front.

Additionally, following meeting on a Sub Brit visit to the former South East London group emergency centre, Pear Tree House, we were also in touch with a former UKWMO Scientific Officer whose experience would undoubtedly shine a light on the larger parent organisation and its inter-relationship with the ROC.

Funds are limited

As a self-funded project, our film was never going to be overflowing with ready funds. Both of us have day jobs in the media industry so whilst a certain amount of kit was available to us, other equipment such as higher-end broadcast-spec cameras, tripods and specialist lighting had to be hired on an as-needed basis, and consumables (this was still very much the era of videotape – albeit digital) purchased.

Large and bulky kit not really suited to filming in confined spaces, but ideal for recording Joe James at The Lizard post! Photo Lawrence Holmes

These overheads, along with travel expenditure meant that the budget, such as it was, wouldn't stretch to the eye-watering sums being requested by the likes of the Imperial War Museum for the use of archive footage. Hence, we were reliant for the most part on material we had acquired ourselves in the form of interviews,

location shoots and the like, as well as being generously granted permission to use photographic material from the Newhaven Fort collection and personal sources.

The practicalities of capturing moving pictures in a number of not entirely well lit situations were of real concern with our limited resources, and of course, the confined spaces that we wanted to film in.

Charles Parker

Naturally, most of the oral history recordings could be made either in the comfort of the participant's own home (in their favourite chair where *they* would be most comfortable and where we could light the subject properly), or in broad daylight outside, where you just have to ride the comings and goings of the sun and hope it doesn't rain. However, we did feel that it was most important to capture the atmosphere inside the posts that we visited, and perhaps more important, the reactions of the participants that we met in them.

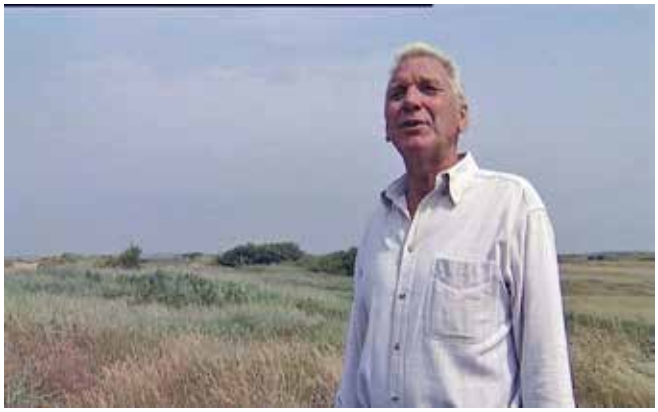
In the days before hi-capacity, lightweight batteries, and economical LED lighting, halogen lamps with only about 30 minutes of use for filming were part of the standard kit. Recharging of such things would require mains which isn't generally available on post locations, so multiple fully charged batteries were lined up for "careful" usage where necessary. On the positive side, the lamps did help keep us warm in some of the underground situations!

On site at Newhaven Fort

Similarly, a smaller, MiniDV camcorder, Panasonic's latest, top-of-the-range prosumer unit, was employed where space and access was going to be an issue for filming with the full kit. Compromise was going to be key to capturing what we wanted, to a reasonable standard that we'd be happy with.

We go on tour

And so, with the commodious boot of Andrew's trusty Land Rover packed to the gunwales with kit, we struck out in all directions to get out and meet the people who had been there both on – and in – the ground. Their stories were going to be fundamental to bringing the physical remains of the organisation to life and helping us and, more importantly, our audience to understand just how well, or otherwise, the system might have worked should they have been given the order to do their duty.



Don Brereton filmed at the site of Great Gatsby post

Our tour of the UK saw us heading north to Lincolnshire and Merseyside, south to Newhaven and the coast, and southwest to Devon and Cornwall.

Lawrence Holmes at Veryan post

We spent a very enjoyable time with Lawrence Holmes at the fully-restored Veryan underground post which commands stunning views of the sea from atop the Roseland Peninsula, approximately six miles southeast of Truro. In collaboration with the National Trust who own the land on which the post is sited, he and a team of volunteers open it up throughout the year where they draw a steady stream of fascinated visitors.

Here also are the embunkered remains of a WWII-era decoy site control room, designed to draw away marauding Luftwaffe bombers from centres of population at night with faked fires, unshaded lights and even the sparks generated by trams and trolleybuses as they contacted overhead power lines.

Nick Catford explores Whitestone post

Also to the west, I had the opportunity to see Nick Catford in action as I joined him in his ongoing quest to log the physical remains of the ROC network. On a particularly wet and windy autumn day I acted as transport and bag carrier as we spent a full-on and fruitful day plying the narrow lanes of Devon. This experience was really my first opportunity to see just how thorough and far-reaching Nick's survey was and I came away with a real sense of admiration for just what he had achieved in this monumental undertaking, and with a small sense of pride that we had played a part – however small – in its completion.

Conditions vary above and below ground

This particular outing also provided us with some great footage of Nick exploring the outlying sites and emphasised just how widely the condition of the remaining posts could vary. Some were in remarkably good condition with sealed hatches and paintwork standing up well to the rigours of Devonian weather whilst others were flooded, vandalised, hatches missing and succumbing badly to being abandoned. Further examples had simply disappeared – either removed completely by the landowners on whose land they had been sited, or so overgrown and inaccessible that no sign of them could be found.

Nick Catford guides us round some of the features of Cuckfield post

Heading south we found ourselves in the pretty Sussex market town of Cuckfield where, in the midst of a nationwide fuel strike which had us nervously eyeing the Land Rover's fuel gauge, we were accompanied again by Nick as well as one of our friends from Newhaven Fort, Cuckfield Post's last Chief Observer Steve Ashdown.

At the time of our visit, the Cuckfield underground post had been left unattended since stand-down in 1991, and it was great to see that, despite this, it was still in reasonably good condition with several "original features" to rediscover.

Arranging permission to access the post was relatively simple since we had been made aware that it was the Parish Council that "had the keys", and a polite letter had been composed and sent as soon as we knew. We appreciated that obtaining the correct permissions would be all the more important since we hoped to be on site for a while, and were bound to attract some local interest!

As well as being Steve Ashdown's "old post", Cuckfield was an important one for us to include for a number of other reasons, not least that it had been the one in which Derek Wood – author of *Attack Warning Red* – had served and it had been our intention to interview him here at his old 'office'.

Regrettably, Derek was in failing health and was unable to join us on the day but we did have the distinct pleasure of having Steve return to Cuckfield for the first time since he had locked up nine years previously, particularly since the interior of the post had had very few visitors since!

Cuckfield post's last Chief Observer, Steve Ashdown, returns nine years after stand-down

Despite some initial nervousness about appearing on camera, his on-screen demonstration of how the post would have operated and his insights into the duties of a Chief Observer on a radio-equipped Master Post were illuminating, invaluable and added well to our story.

Cuckfield post now restored and open to visitors

In more recent years, it has been interesting to keep up to date with the restoration work done at Cuckfield. The fact that it has been possible to open it to curious members of the public is important when it comes to keeping the story of the Corps alive.

At the other end of the country, we joined Lincolnshire Sub Brit members and former ROC crew Terry Wiseman and Charles Parker for a fascinating day's filming in 'Bomber County'.

Recording Terry Wiseman's memories of how short the grass once was at Market Rasen post.. Photo Charles Parker

As mentioned previously, Terry had a background not just in the Corps but also in the Civil Defence organisation so he was able to give us a particularly insightful view of the bigger picture into which the UKWMO and the ROC fitted. However, it was his service as Chief Observer at Market Rasen post, where we sat him down to chat on camera, that was particularly enlightening as he related tales of life on the post.

Quite evidently, Terry was extremely proud of his service to the Corps and lamented the fact that the once immaculately trimmed prize-winning grass in the post compound was now in danger of overwhelming the structure – much to his chagrin.

He also told us how on night exercises it was a running joke that at least one of the crew would inevitably trip over the Bomb Power Indicator (BPI) tube jutting out of the ground in the dark and roll down the mound cursing whilst his crewmates below chuckled knowingly, having done it themselves many a time.

As we bade him farewell, Terry kindly handed us an armful of priceless ROC training material which he had accumulated. Then, with Charles guiding us, we headed in the direction of Winterton post, a couple of miles south of the Humber, where he'd spent his early days as a youthful recruit with the ROC. En route he pointed out the many disused RAF airfields and abandoned bomb dumps with which this part of the country is littered and which earned it the nickname of 'Bomber County'.

Charles Parker remembers the last aircraft tracking exercise with the Corps

At Winterton, Charles related how he'd joined up primarily due to his obsession with aircraft – a big draw for ROC members in those days (not all of them young lads either) – with Lincolnshire especially being prime spotting territory. Beaming, he told us of watching aircraft movements at nearby Leconfield and seeing USAF Voodoos on manoeuvres above the post, then, upon descending the ladder into the post, he gave us a tour of his former home from home and told us why there was a great big ex-ambulance bench seat taking up most of the room in there..

The important question

Throughout the course of conducting our interviews, one of the questions we asked our subjects was: "*Do you think it would have worked on the day?*"

The one thing that every response had in common was an initial pause, usually followed by a slow and considered breath and a look into the distance before a guarded but cautiously-optimistic answer which was generally along the lines of "*Well, I'd like to think that it would but fortunately we never had to find out.*"

Charles was a little more circumspect when we asked him, telling us that he had questioned at the time the viability of the plan to have the GPO or latterly BT hurriedly bury 800-odd vulnerable telephone lines at posts in the sudden build-up to a possible nuclear war..

Another curious shooting day saw us turning up one morning at a nondescript block of student accommodation about a mile southeast of Oxford city centre. Not the most obvious location perhaps, but, upon further inspection, this recently redeveloped site just off the Cowley Road revealed a fascinating secret buried just below the students' lodgings, evidenced by two large and rather incongruous metal ventilation pipes sprouting from the grass courtyard between two of the blocks of dorms.

A stroll around the corner revealed a gentle slope leading to newly-installed double doors one storey below ground level giving onto a familiar-looking large, double height room with stairs up to a gallery around three of its sides.

This was – or had been until the end of the Cold War – the Royal Observer Corps No 3 Oxford Group HQ building. One of the distinctive semi-sunken structures often referred to as the 'Aztec Temple' for their above-ground

design, it had been co-located with the administrative HQ of its parent outfit, the United Kingdom Warning and Monitoring Organisation (UKWMO).

Nick Catford shows us round the Oxford HQ, pointing out the alterations that had been made

In 1998, Oxford Brookes University had cleared the site and built the aforementioned student digs. In the process they had removed the distinctive Ziggurat-like entrance structure and the decontamination area contained within, but had retained the remainder of the bunker pretty much intact with a view to using it as an events venue for gigs, club nights and other student social activities. However, despite the provision of the new entrance on the lower level, this wasn't deemed sufficient to satisfy fire regulations, so at the time of our visit, the newly-repainted HQ was being used as storage, with mattresses and cooking utensils stored in various of the rooms throughout the bunker.

Oxford Group HQ. At time of visit, used primarily for storage

Whilst sadly there were few reminders of the building's former purpose – limited in the main to a pair of perspex screens with maps of the outlying posts and a remarkably well-preserved standby diesel generator – our visit did give us an idea of the extent and layout of a typical Group HQ, and afforded us some more useful footage, as well as giving us the opportunity to meet up with a few fellow Sub Brit members who'd joined us for a nose-around.

Oxford HQ's generator and other plant still in place

By contrast, a little later (and unfortunately too late for inclusion in ***Tocsin Bang***), we were invited to see inside another Group HQ building, this time the York HQ at Acomb, while it was being assessed by English Heritage.

York HQ

The contrast with the Oxford structure was stark, the more northerly example presenting itself as a veritable time capsule preserved pretty much in the state it was left when the last ROC member locked the door in 1991. (There was a Sub Brit visit here in September 2008 – see *Subterranea* 18, January 2009.)

York HQ Control Room

York HQ Tote Boards and Maps

Everything was as the staff and volunteers would recognise it. Whereas in Oxford the tote boards had been screwed in place and painted over, here they swung freely in their frames, with written information still visible, ready once more to relay news of first fallout to anyone who might need to pass on a warning. There were even a couple of ROC-issue waterproof mackintoshes hanging on the back of one of the doors, gently mouldering as the effects of ten years of stale air began to make themselves felt.

York time capsule has English Heritage protection

Following our visit to York, No 20 Group HQ underwent preservation by English Heritage and is now a popular visitor attraction in this historic city where it enjoys Scheduled Monument status, affording it the same protection and importance as ancient military fortifications centuries older than its own comparatively youthful sixty years.

York HQ. ROC-issue mackintoshes remained in situ

And so, after a lot of travelling, filming, talking and squeezing in and out of those infernal access shafts, we decided that we probably had enough material to put together the story we were keen to tell.

Transcripts of all of our interviews were made, and the curious task of classifying each section of speech based on subject matter and clarity, and then literally cutting and pasting each of the best bits onto new pieces of paper to tell the story, was rather time consuming, with an infinite number of combinations. However, it meant that the first cut of the edit had been completed without having to turn on a monitor!

Through a friend, we were fortunate enough to be put in touch with a very talented 3D modelling expert whose usual fare involved work for certain government 'clients' but who welcomed the chance to help visualise something that wasn't on the secret list – at least, not any more.

After a briefing session at his office, a location which in itself was quite an eye-opener, he created for us a fantastic, animated 3D cutaway of a 'typical' underground monitoring post (modelled incidentally on the Cuckfield post we had visited earlier). We both agreed that even though he hadn't charged us a huge amount for his services, this was definitely money well spent for the visual clarity this animation would offer viewers of the documentary.

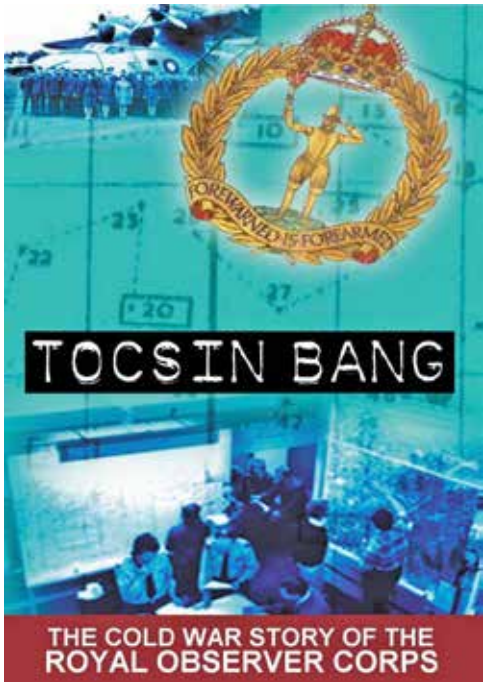
A soundtrack provided gratis courtesy of my musically-talented brother and narration provided on similar financial terms by me gave us the audio to go with the video and so all that remained was for it to be deftly woven together by Andrew using the industry-standard Adobe Premiere editing software.

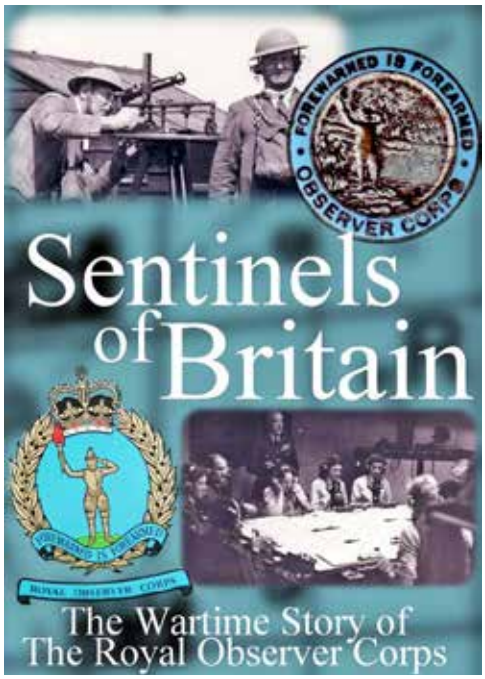
3D model of a standard ROC post, integrated with footage shot at Cuckfield post

From a technical perspective, all of our footage had been shot and edited in Standard Definition 16:9 widescreen which at the time was beginning to become the usual broadcast format on UK television, replacing the square(ish) 4:3 pictures we had been accustomed to.

This, we believed, would afford us a certain amount of future-proofing and hopefully not date too quickly – at least not from a technical perspective. Nowadays of course, even the average smartphone is capable of recording ultra-high definition video with ease but the quality of the final cut which we output onto broadcast-quality Digital Betacam tape for mastering still stands up to this day.

Distribution of the original VHS copies (remember those?), and subsequently DVDs, was handled by yet another contact with ROC connections. Ken Cothliff in Yeadon who ran Air Supply, an aviation supplies shop within spitting distance of Leeds Bradford airport, had served on a nearby post until stand-down. An enthusiastic supporter of the project, Ken was, like so many of his





former colleagues, a wonderful champion for the film, and we knew we were in safe hands.

Incidentally, Leeds Bradford Airport is in itself an establishment with its own ROC connections, sporting as it does a disused former Group HQ bunker on its periphery.

Throughout the production of ***Tocsin Bang*** we were often told, "Oh, and you must speak to so-and-so about their time in the Corps during the war." How could we not? And now we look back and are really glad that we did.

Sentinels of Britain was released three years after its predecessor and perhaps in the fashion of a prequel does indeed go back and tell that story of how a formerly ad-hoc cadre of Special Constables standing in fields was transformed and became the professional, highly-disciplined and indispensable Eyes and Ears of the RAF.

But that, as they say, is another story..

So, there we are. ***Tocsin Bang*** first saw the light of day in 2002 and continues to attract viewers on DVD to this day. Both of us remain immensely proud of what we produced and are forever indebted to those who helped us out along the way.

We had heard our subjects tell us all about what had driven them to serve, and what their families had thought about it. The Transition to War process and how they would have been called out. What they would have done if they had been the ones playing nuclear musical chairs 'down the hole' when the dreaded *Attack Warning Red* sounded and whether in fact they believed the system would have worked at all.

We'd also heard tales of illicit mains hook-ups to posts and the installation of dodgy microwave ovens. Of unfortunate incidents with the contents of Elsan toilets; the unwelcome post visits from CND campaigners convinced that there were miles of tunnels where in fact there was a concrete box just 15.5 x 7.5ft: and many *many* stories of the excellent buffet meals laid on at social functions..

Perhaps most importantly though, we had learned not just about the organisation itself, but also about the people who made up that organisation, and who would be so fundamental to its efficacy if their services had ever been called upon for real.

Continued interest

In 2021, it had been our plan to revisit ***Tocsin Bang*** and update it, and its sister film *Sentinels of Britain*, to commemorate the 30-year anniversary of stand-down in 1991. Unfortunately the pandemic rather put the brakes on that idea, the wisdom of recording in close confines with an ageing cast questionable.

However, hopefully there will soon still be a chance to explore the previously more secretive topics such as the Corps' role post-1991 (i.e. the NRC/NBC Cells described in detail by John Shere in *Subterranea* 39, August 2015), talk to more ex-Observers, and visit some of the many restored posts and centre buildings.

Inevitably, a number of those who appeared in ***Tocsin Bang***, and particularly *Sentinels of Britain,* are no longer with us, so our opportunities to record return interviews are dwindling, but we remain hopeful that conditions will continue to improve and that we shall once again have the opportunity to shine a light on an organisation and a part of our history which deserves greater recognition.

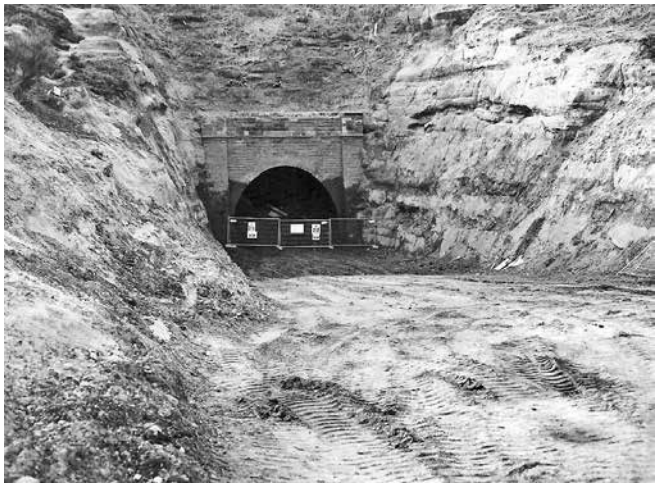
We are glad to say that key parts of many of the recorded interviews from both programmes have been shared more widely through museum displays (including at the Battle of Britain Bunker), podcasts, and radio broadcasts. It is through media such as these, and the continued interest of members of groups such as Subterranea Britannica, that the story of the Royal Observer Corps will be passed on and remembered for many years to come.

Reopening in 1994 of the Kirkby tunnel, Nottinghamshire

Paul W Sowan

Richard Beeching, notoriously, recommended the closure from the 1960s onwards of many miles of British railway lines and many stations, accelerating a pre-existing trend commencing at about the time of World War I, conveniently providing the answer the then Minister of Transport (of the motorway building firm Marples Ridgeway) required. Additionally, many miles of line were reduced from double to single tracks, making continued operation on the surviving bi-directional lines awkward.

Since then, some miles of line have been re-opened, single lines re-doubled, and new stations built. An example of rail service restoration is the Mansfield to Worksop line in Nottinghamshire. The greatest engineering challenge in re-opening the so-called 'Robin Hood line' was posed by the 180 metres Kirkby tunnel, both portals of which had been blocked with 6,000 cubic metres of soil. The southern end of the line had already been reopened to traffic when, on 22 February 1994, reopening the tunnel commenced in the presence of assembled dignitaries from Nottinghamshire County Council. Work on the remainder of the line to Worksop was reportedly progressing well, with a number of new stations to be provided.



The east portal of Kirkby Tunnel after re-excavation in 1994

SOURCE: CORMACK, John, 1994, Kirkby tunnel reopening for business again. Digging ceremony marks new stage in 'Robin Hood' project. *Railway Magazine* 139 (1116), page 40.

The Courtauld Industrial Group of Air-Raid Shelters, Halstead, Essex

Tim Wellburn

Halstead town centre (the High Street runs diagonally, top left). The big car park and adjacent supermarket building was the Courtauld factory site, bounded to the north by Factory Lane East with its two long terraces of 1872 company houses. The air-raid shelters (all but invisible here) are located just behind the gardens of these terraces and the adjacent houses. Google Earth

Halstead Heritage Park – an alternative vision

Attendees at Sub Brit's 2018 Spring Conference will recall the spirited presentation given by Eileen Penn and Helen Wolf of Halstead 21st Century (H21C), a local environmental and conservation group formed to try to protect Halstead's natural and built heritage.

A live issue was the fate of the unique Courtauld industrial group of 15 Costain air-raid shelters and one above-ground shelter. A major development proposal would have seen this demolished. H21C had prepared an inspired alternative vision, "Halstead Heritage Park", which would preserve these historic shelters and adapt the site as a town centre green space for community use. As well as filing a planning objection to the development proposal, Sub Brit had been able to assist H21C's lobbying efforts with a grant towards the publication of this alternative strategy document.

A ground-level view of Costain shelter No.6, with the above-ground shelter, almost lost in vegetation, behind it. The top of the access steps would have had a wooden door. Photo Tim Wellburn

That vandalistic development proposal was rejected by Braintree District Council, but the threat to the shelters remained. H21C subsequently succeeded in generating enough support to secure a change in the draft Local Plan. In place of the risibly inadequate provision for the "*retention and refurbishment of at least one air raid shelter*" the adopted plan now requires "*the retention and refurbishment of the air raid shelters*" – in principle giving protection to the whole group. Sub Brit endorsed this in our consultation comments.

At the bottom of the steps the shelter entrance is protected by a lightweight steel blast door. All these doors are still in place. Photo Tim Wellburn

At the far end of each Costain shelter is an emergency exit through a roof hatch reached by a vertical steel ladder. Photo Tim Wellburn

Sub Brit arranges a site visit

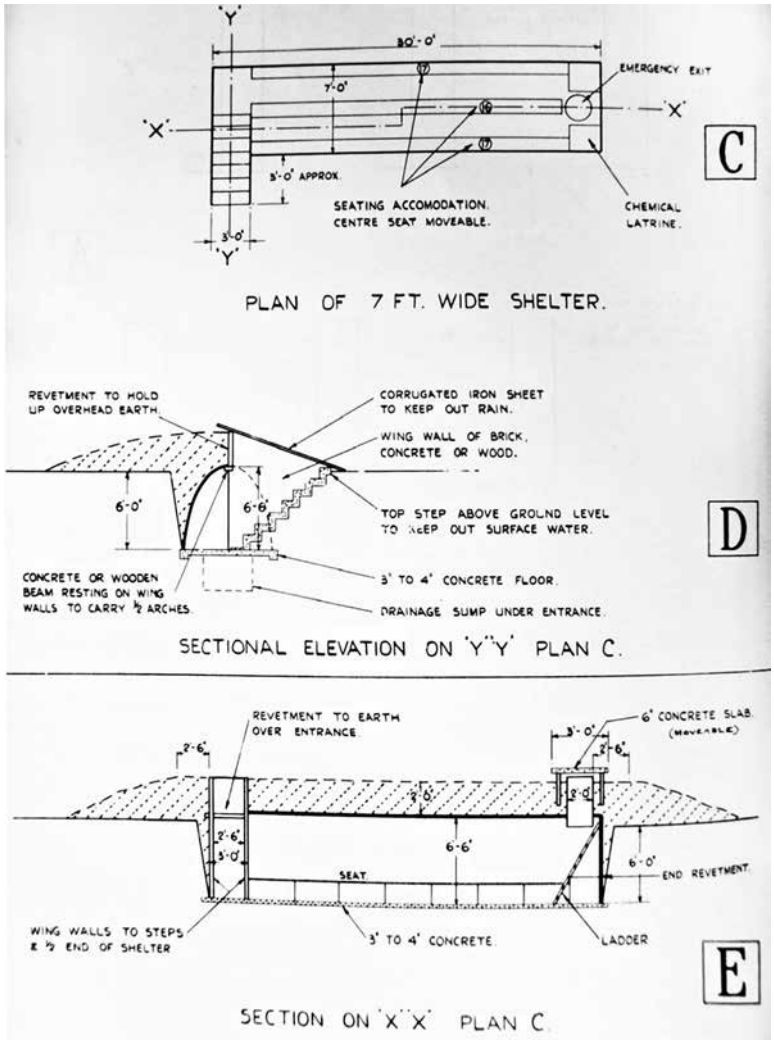
In the light of these planning developments, Adrian Armitage and I (who, with Martin Dixon, were the drafters of Sub Brit's planning representations) felt we should make a site visit and meet H21C again. Eileen Penn, H21C's Chair, welcomed this and, while noting the sensitivities attaching to this privately owned site, kindly agreed that we might expand our proposed fact-finding trip into a small-group Sub Brit visit. This took place in March of this year and we were delighted to be welcomed by a large gathering of H21C's trustees who explained the current development proposals and considerations, and then led us on an inspection of the entire site.

Eileen Penn briefs Sub Britters on the latest development threat to the air-raid shelters: hence the uniformly gloomy faces. Adrian Armishaw is making a recording while Malcolm Collins contemplates the emergency exit of one of the Costain shelters – perhaps assessing the scope for restoration? Photo Tim Wellburn

A short history of Air Raid Precautions

The Committee of Imperial Defence formally turned its mind to air raids in relation to the civilian population in 1924 when it set up the Air Raid Precautions (ARP) sub-committee. In April 1935, following Germany's revelation of its Luftwaffe, the ARP sub-committee was made responsible for the development of passive air defence.

Legislation followed, including the Air Raid Precautions Act 1937, which required local authorities to make provisions for "*the protection of persons and property from injury or damage in the event of hostile attack from the air*", and later the Civil Defence Act 1939, which, inter alia, required companies to report on measures being taken to provide air-raid protection for people on factory premises. The Courtauld shelters, which date from 1939, seem to have been constructed in response to this.



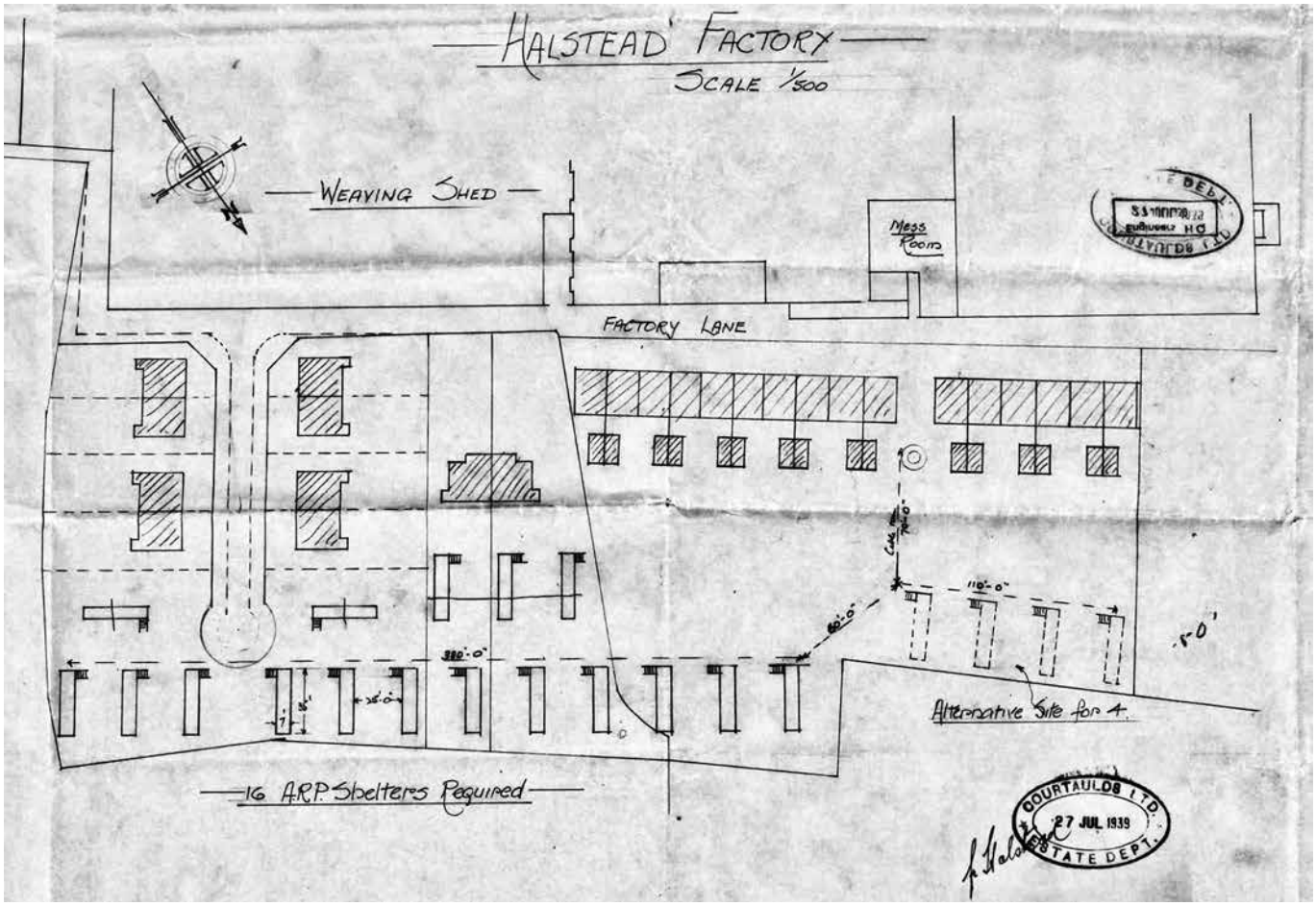
Left :
Air Ministry "Air Raid Precautions for Factories", January 1939: a sample of the detailed guidance provided for shelter construction. The Courtauld group shelters closely conform to this. HMG, reproduced in Ettwein Bridges' Heritage Statement (see Sources below)

Detailed guidance and standards were set out in an Air Ministry pamphlet "*Air Raid Precautions for Factories*" issued in January 1939. To minimise casualties in the event of a direct hit or near-miss, air-raid shelters were to be as dispersed as possible, with a minimum spacing of at least 25ft. They were to be set at a depth of 6ft (or as deep as soil conditions allowed) and covered with 18in to 2ft of soil. Refined specifications followed in the Air Ministry's *ARP for Factories, Section III, Application of Standards.*

The Courtauld shelter group

The Courtauld shelter group was to be built on the rising ground to the north of Courtauld's town-centre factory in the (then very long) gardens of company-owned houses in Factory Lane East and

Below :
Courtauld Estate Department's schematic diagram, bearing the date stamp 27 July 1939, for the provision of factory air-raid shelters in the gardens of the company-owned housing in Factory Lane East and adjacent Vicarage Meadow. (Note that the plan is orientated south uppermost.) Essex Records Office



This plan (north uppermost) shows the Courtauld shelter group as built. The above-surface shelter is shown as a rectangle at the start of the longer row of Costain shelters. © Essex County Council Field Archaeology Unit

adjacent Vicarage Meadow. This appears to have been the only land that was available sufficiently near to the factory.

The Courtauld diagram of 27 July 1939, reproduced opposite, states *"16 ARP Shelters Required"*, but evidently the arrangement of these was still to be finalised. Seventeen shelters are shown in hard outline: twelve in a long row running from the eastern side of the site and another five, variously aligned, just to the south of them. However, this second row of shelters has lines struck through them, and the diagram shows an "*Alternative Site for 4*" behind the western terrace in Factory Lane. These are drawn in dashed outline.

The shelters, as built, broadly follow the "alternative site" option of the July 1939 diagram. They are arranged in a stepped row, running approximately NW-SE, following the contours. In the event five, rather than four, shelters were built on the slightly lower alignment at the western end of the site and two were deleted from the long (higher) row – one from either side of

The above-ground shelter, almost entirely enveloped in vegetation, which it seems to have survived. Photo Tim Wellburn

the Vicarage Meadow cul-de-sac. Construction must have been rapid because the factory log shows them in use very soon after war broke out.

The reinforced above-ground building, not shown on the July 1939 schematic diagram, is set at the western end of the upper row of ten Costain shelters. This enigmatic brick-built structure is divided into two large main rooms of unequal size. Two internal doorways provide access to what may have been lavatory cubicles. The building has been described variously as an air-raid shelter, an ARP warden's post, a first-aid post and a communications centre. Almost certainly, it is too large to have been simply a warden's post, and it demands further study.

One of the two large rooms within the above-ground shelter. Water and mud run-off from the slope above, and dumped rubble and other rubbish currently detract from its ambience. Photo Tim Wellburn

This appeared to be the most deeply flooded of the accessible shelters: the entrance was a quagmire, making photography hazardous! Somewhere under the mud there must be a drain to be unblocked. Photo Tim Wellburn

The whole site is overgrown with vegetation – including some large self-seeded trees which, remarkably, do not appear to have caused structural damage to the shelters. Inevitably, rubbish has been tipped here, including in several of the shelters, and there is some graffiti. More importantly, past disruption of the site's drainage has caused the diversion of surface water, rendering some areas very boggy, depositing mud in most of the shelters and partially flooding several of them.

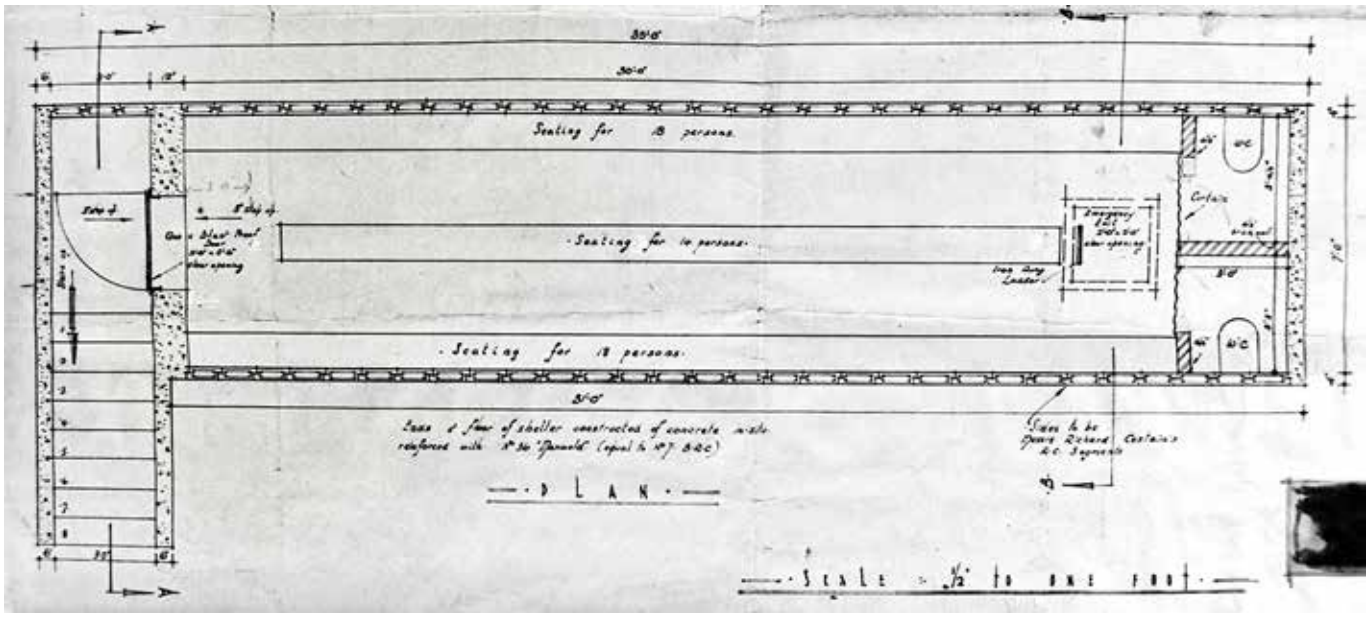
Costain Shelters

Richard Costain Ltd produced shelters which were largely prefabricated, comprising a set of pre-cast reinforced concrete parts which was assembled on a locally-laid concrete floor. The half-arch sections were only 9 ins wide, minimising weight for ease of handling. End walls and emergency exit hatches were other standard pre-cast items.

A set of Costain-supplied parts for a 50-person shelter cost £70. The market seems to have been competitive because several other London companies supplied broadly similar products: Trollope & Colls, Norcon, Tarmac, John Ellis & Sons and Girlings Ferro-Concrete.

The Courtauld Costain shelters were designed for 50 people – the maximum allowed under Air Ministry standards for factories. They were 24ft (7.3m) long by 6ft 6 ins (2m) wide, with similar headroom. At the far end were two cubicles for chemical toilets. Seating would have been on three sets of longitudinal benches, accommodating 18 people along each side and another 14 down the centre. The shelters were supplied with electricity.

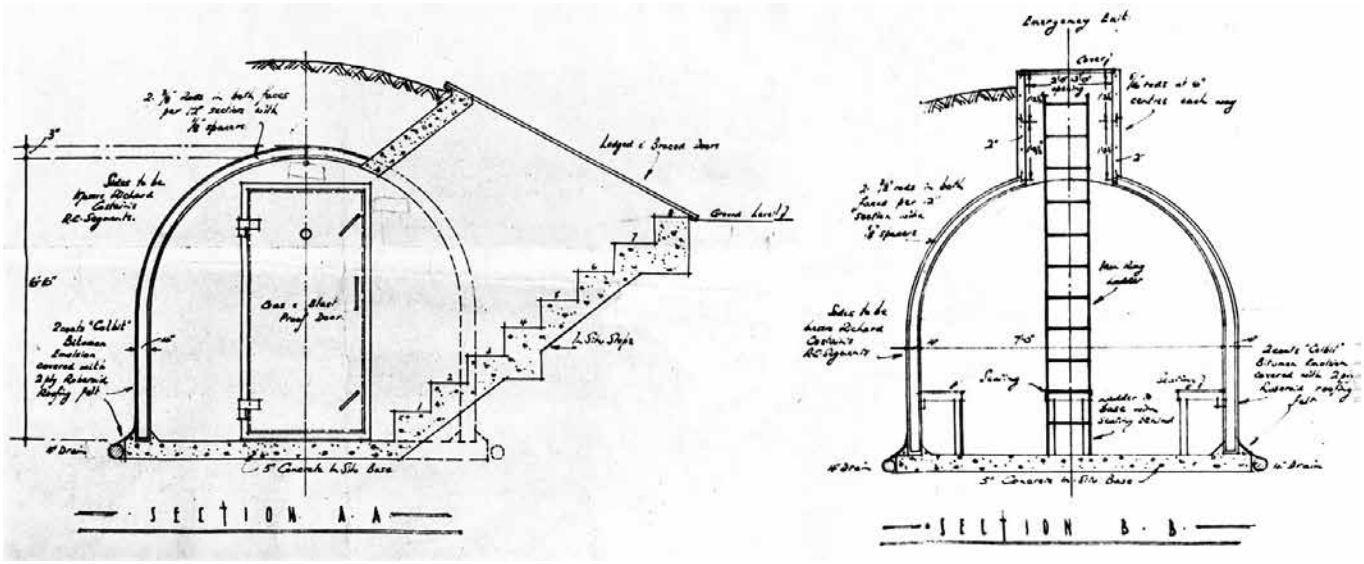
Each shelter had an entrance at one end, accessed down a hooded set of concrete steps set at right angles to it. The other end was provided with an emergency exit through a roof hatch, reached by a vertical steel ladder. The entrance blast doors and steel ladders seem all to have survived, although few shelters have retained the metal hatch covers to their emergency exits.



A contemporary plan of a Costain air-raid shelter for 50 people, as constructed by Courtauld at Halstead. Essex Records Office

The apparently sound and remarkably tidy interior of one of the Costain shelters. Few fittings or artefacts remain in the shelters other than the steel entrance doors and emergency exit ladders. Photo Tim Wellburn

The shelter retains wooden lavatory doors, still marked M and F. Note however, that the plan (above) shows the WC alcoves as screened only by curtains, as was common practice in shelters. Photo Tim Wellburn



Sections through the entrance and emergency exit of the Costain shelters (1939). Essex Records Office

The entrances to shelters 6, 7 & 8, with the above-ground shelter in the background. Photo Tim Wellburn

The Costain emergency exit: built to plan! Photo Tim Wellburn

One of the pair of mirror-image Costain shelters at the SE end of the site. These are rather overgrown and not very photogenic or accessible. Photo Tim Wellburn

The entrances, logically, are all set at the end nearest to the houses/factory, but whilst the first 13 shelters have these facing SE, the final pair, lying beyond the cul-de-sac, are built in mirror image, with their entrances facing NW – presumably for more convenient access.

Another development proposal...

Developers never go away. No sooner was the ink dry on the Local Plan than another company, Halstead New Homes, submitted an application for infill housing on the site, seeking to erode the plan's requirement for "*the retention and refurbishment of the air raid shelters*".

The current proposal would retain the first eight and last two of the Costain shelters, together with the above-ground ARP building (which would be repurposed), but would demolish a run of five of the Costain shelters, physically and visually destroying the unique group

characteristic and related value of this important site. The developer suggested that two of the retained shelters could be restored for public access.

Heritage organisation views

There have been three attempts to have the Courtauld shelter group listed: the first in 2005/6 by Judith Slater, subsequently to become the first Chair of H21C; the second in 2013 by Helen Wolf on behalf of H21C, based on new information that had become available; and most recently, this year, by a local resident.

In 2006 English Heritage had declined listing on the grounds that the shelters' significance and group value was diminished by the (1986) demolition of the factory they served and whilst of local importance they were "*of insufficient special architectural and historic interest in the national context to merit listing*."

However, this conclusion was reached before later research, undertaken principally by Ettwein Bridges Architects (2012), revealed the Courtauld shelters to be the only known surviving examples of Costain shelters, and also the UK's largest extant factory shelter group. It is thus eminently arguable that they have considerable national heritage significance, as well as local importance in terms of Halstead's Courtauld industrial history, but English Heritage has yet to be persuaded.

Mainstream heritage: the Grade II listed terraced housing in Factory Lane East built by Courtauld in 1872 for employees. In 1939 the upper part of their long gardens became part of the land used to construct the air-raid shelters which no doubt provided some peace of mind to their tenants. In fact, there were no air attacks on the factory although air-raid warnings stopped work on 170 occasions. Photo Tim Wellburn

Sub Brit lodged a planning objection[1] to the latest development proposal. This argued for the safeguarding of the entire group, as provided for in the recently adopted Local Plan. The Association for Industrial Archaeology and the Essex Industrial Archaeology Group both did likewise.

The Council for British Archaeology, like Sub Brit and others, has supported H21C in their campaign work on the heritage value of this site, and continue to stress the significance of these structures, based on their "*group value, completeness and heritage values*". However, they are concerned to secure a sustainable future for at least the greater part of this asset.

Despite the proposed destruction of five air raid shelters – which they would regret – their June 2022 planning submission was broadly supportive of the current development proposal subject to any planning permission being made conditional on a funded conservation management strategy that would provide for the repair, stabilisation, maintenance, interpretation and ongoing management of the (residual) group.

The Courtauld shelters are on SAVE Britain's Heritage Buildings at Risk Register. Photo Tim Wellburn

Acknowledgements

We are grateful to Halstead 21st Century, and in particular to Eileen Penn (Chair), Jan Mellon (Membership Secretary) and fellow trustees, for arranging our visit, briefing us and keeping Sub Brit posted on planning developments. We remain very supportive of their determined efforts to achieve the best practical outcome in safeguarding this nationally important ARP site.

Notes

[1] The text of Sub Brit's July 2022 planning objection was posted on the Forum on 2 July under H21C's Military (pre-Cold War) thread "*ANOTHER planning application for the Halstead Air Raid Shelter Site".*

Sources

Halstead 21st Century Group

Helen Wolf, *Courtauld Factory Air-Raid Shelters, Essex*, *Subterranea* 51, August 2019

Courtauld Factory Shelters, Essex – Conservation Progress Report, *Subterranea* 55, December 2020

HCUK Group, *Heritage Impact Assessment – Land East of High Street, Halstead, Essex*, May 2022. (This document was prepared on behalf of the developer, Halstead New Homes.)

Ettwein Bridges, *Land East of the High Street, Halstead, Essex. Heritage Statement Appendix C: Appraisal of World War II Air Raid Shelters*, July 2012.

Health and safety underground: water

Paul W. Sowan

Your Committee, some years ago, resolved that *Subterranea* should contain occasional articles on health and safety matters with particular reference to underground visits, although no such articles have appeared for several issues. Members should bear in mind that the scope of the provisions of the *Health and Safety at Work &c. Act* of 1974 apply beyond the realms of paid employment, and relate to activities which in some respects other than payment may be said to resemble work.

Essentially, the Act makes it a legal duty of all of us to appraise situations whether in our everyday lives or in unfamiliar circumstances, recognise and evaluate dangers to ourselves and to others, and behave accordingly. And bear in mind, also, that familiarity breeds contempt! Your scribe has tripped and fallen often enough, and fortunately without dire consequences, but thankfully never whilst in precarious places in the glaciers and mountains of Iceland, but only once underground!

The dangers posed by water underground fall into several categories. Weil's disease, an unpleasant and dangerous affliction which doctors not looking for it may have some difficulty in identifying, is a threat posed by water contaminated by the urine of infected rats. Well-organised cavers are advised to carry a 'Weil's disease' card to alert doctors. Hypothermia is a killer, and results from the lowering of the core body temperature to a dangerous level. It applies as much to cavers more or less immobilised in cold water, perhaps waiting to climb a ladder pitch, as is does to walkers in the countryside in snow. Wet suits for any extended wet underground trip are advised and, otherwise, as far as possible, keep on the move. Anybody who has sat around for any time underground will recall how cold they feel after a short while. Your scribe, again, has camped and mountain-walked in snow in Iceland and Scotland for anything up to a month at a time and survived as a result of appropriate clothing and exercise. His closest approach to hypothermia was after a winter walk in the snow on the North Downs!

Flooding and drowning underground are well-recognised hazards, and anybody going into a place full of running water should be familiar with the flooding history of the site, and pay full attention to weather forecasts.

But this article is written specifically to highlight an at first sight less obvious problem posed by still water. Undisturbed water lying in caves, mines and tunnels can be very still, and very clear (in fact, almost invisible at times if tell-tale reflections don't alert the explorer). The clarity is a result of the stillness, and the stillness for weeks or months or more has allowed all fine suspended material to settle to the floor as a layer of mud.

Apart from the fact that such a layer of mud may hide, for example, deep shafts lying below rotten timber, it has to be remembered that once you have waded through the still water the mud is stirred up and makes the water opaque. Anybody following will be unable to see problems, as also will you if returning by the same route.

On one occasion your scribe, along with another Subterranea Britannica member, was wading along a flooded copper / arsenic mine tunnel on the Devon / Cornwall border. On the way in, the very clear water about a foot deep allowed us to see and avoid a flooded shaft on the left-hand side of the tunnel. On our return we were quite unable to see the shaft through the now muddy water, so we kept close to the opposite side of the tunnel on the way out.

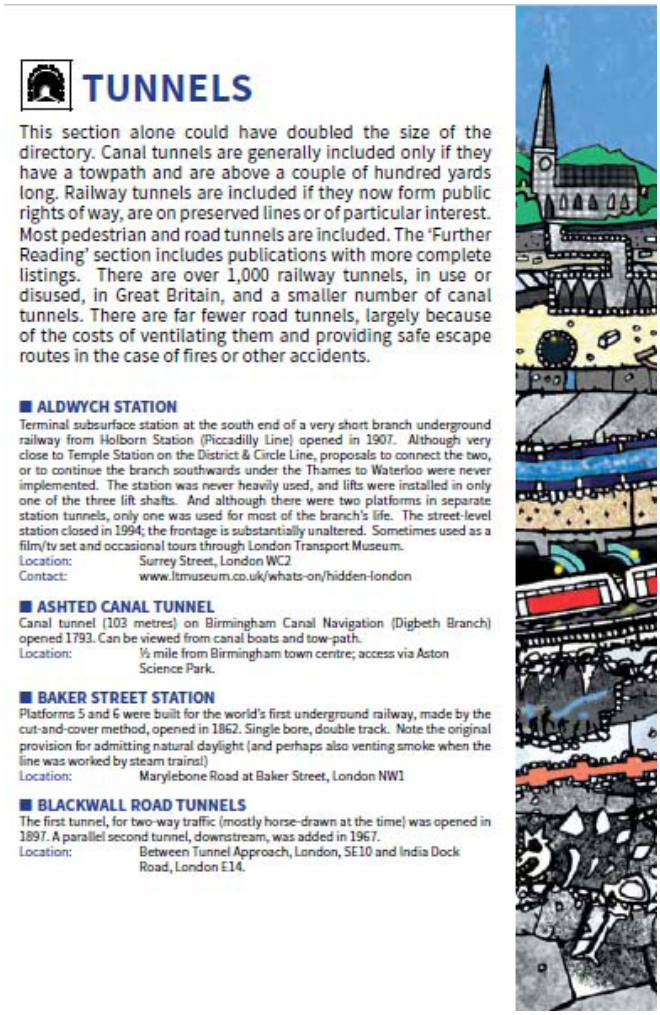
On a second occasion, in a long-abandoned World War II tunnel, I was a member of a group visiting an area with a muddy concrete floor covered by about a foot of initially very clear water. Those at the front were well able to see assorted trip hazards on the left, and a shallow pit in the floor on the right. Regrettably, it did not occur to any of them to call back to persons following, now wading in opaque rust-coloured water. We followers therefore proceeded slowly and cautiously, despite which your scribe fell into the said pit. Fortunately this was not very deep, did not contain masses of jagged rusty iron, and your scribe did not fall flat on his face or drown! He called back to those behind him to keep to the left-hand side of the tunnel, and negotiate the waterlogged timber trip hazards lying unseen. In catching up with the main party, he was told it was his own fault for 'not keeping up'! To be told off for taking health and safety seriously and taking all appropriate precautions was quite inappropriate. None of us of course, on the way back out, were able to see the pit or the trip hazards!

Deep water is often found in bunkers as seen here in the lower level of the Wartling ROTOR bunker before pumping was completed. A wet suit is always advisable in sites like this. Photo Nick Catford

Sub Brit: UK Site Directory

Linda Dixon

Now that attractions are opening up again to the public, it is a chance to start exploring again and get underground. A few years ago Sub Brit published a revised edition of our UK Site Directory which contains details of almost 300 underground related sites, spread across the country.



TUNNELS

This section alone could have doubled the size of the directory. Canal tunnels are generally included only if they have a towpath and are above a couple of hundred yards long. Railway tunnels are included if they now form public rights of way, are on preserved lines or of particular interest. Most pedestrian and road tunnels are included. The 'Further Reading' section includes publications with more complete listings. There are over 1,000 railway tunnels, in use or disused, in Great Britain, and a smaller number of canal tunnels. There are far fewer road tunnels, largely because of the costs of ventilating them and providing safe escape routes in the case of fires or other accidents.

■ ALDWYCH STATION

Terminal subsurface station at the south end of a very short branch underground railway from Holborn Station (Piccadilly Line) opened in 1907. Although very close to Temple Station on the District & Circle Line, proposals to connect the two, or to continue the branch southwards under the Thames to Waterloo were never implemented. The station was never heavily used, and lifts were installed in only one of the three lift shafts. And although there were two platforms in separate station tunnels, only one was used for most of the branch's life. The street-level station closed in 1994; the frontage is substantially unaltered. Sometimes used as a film/tv set and occasional tours through London Transport Museum.

Location: Surrey Street, London WC2
Contact: www.ltmuseum.co.uk/whats-on/hidden-london

■ ASHTED CANAL TUNNEL

Canal tunnel (103 metres) on Birmingham Canal Navigation (Digbeth Branch) opened 1793. Can be viewed from canal boats and tow-path.

Location: ½ mile from Birmingham town centre; access via Aston Science Park.

■ BAKER STREET STATION

Platforms 5 and 6 were built for the world's first underground railway, made by the cut-and-cover method, opened in 1862. Single bore, double track. Note the original provision for admitting natural daylight (and perhaps also venting smoke when the line was worked by steam trains!)

Location: Marylebone Road at Baker Street, London NW1

■ BLACKWALL ROAD TUNNELS

The first tunnel, for two-way traffic (mostly horse-drawn at the time) was opened in 1897. A parallel second tunnel, downstream, was added in 1967.

Location: Between Tunnel Approach, London, SE10 and India Dock Road, London E14.

Some members will have seen this already, but if you have joined in the last few years, you may not be aware of it. This full-colour edition builds on the original which was produced by Roger Starling in 2011 and was coordinated by me with updates and information provided by many members.

Cost is £5, to include post and packing.
If you would like a copy, then please contact me via: publications@subbrit.org.uk

The Sub Brit Forum
-or- How to keep up to date with events and news

If you are not using the Sub Brit Forum you will be missing out on news about events and on general information and discussion on underground matters. But did you know that you can still get any category of Forum posts **emailed** to you? To get this set up you will need to log on to the Forum at least once (see below). Once you are set up you can even reply by email to topics and automatically update the Forum. Here are some hints to help you.

First, Log on to the Forum (see below). Have a look round the Forum to see what's there.

You can browse **Categories** (eg 'Cold War', 'Transport') by clicking on 'Categories' in the middle of the top line (or in the box, top left, for a fuller display).

You can search for **Topics** (eg 'Tube Map') by using the 'Magnifying Glass' symbol near the top right-hand corner.

To get back to the Forum Home Page, click 'Subterranea Britannica' on the black banner.

To get **emails** (notifications) about material posted to the Forum:

click on the big bold letter (this will be the first letter of your username) or your photo, (if you've set one up) in the top right-hand corner

select the little man symbol, and then click 'Preferences'

then 'Categories', under 'Notifications' down the left-hand side

Select the categories you want to be notified about using the boxes on the screen.

You can also stop emails ('mute') about a topic or category here.

Another way to get email notifications, once you know the Categories you look at most:

1. Navigate to 'Categories' from the main Forum page.
2. Click the Category of interest.
3. In the top right-hand corner, click the button marked with a '🔔' next to 'New Topic' and select the type of notification you want. You will then get emails for every post here.
4. You can change your preferences at any time.

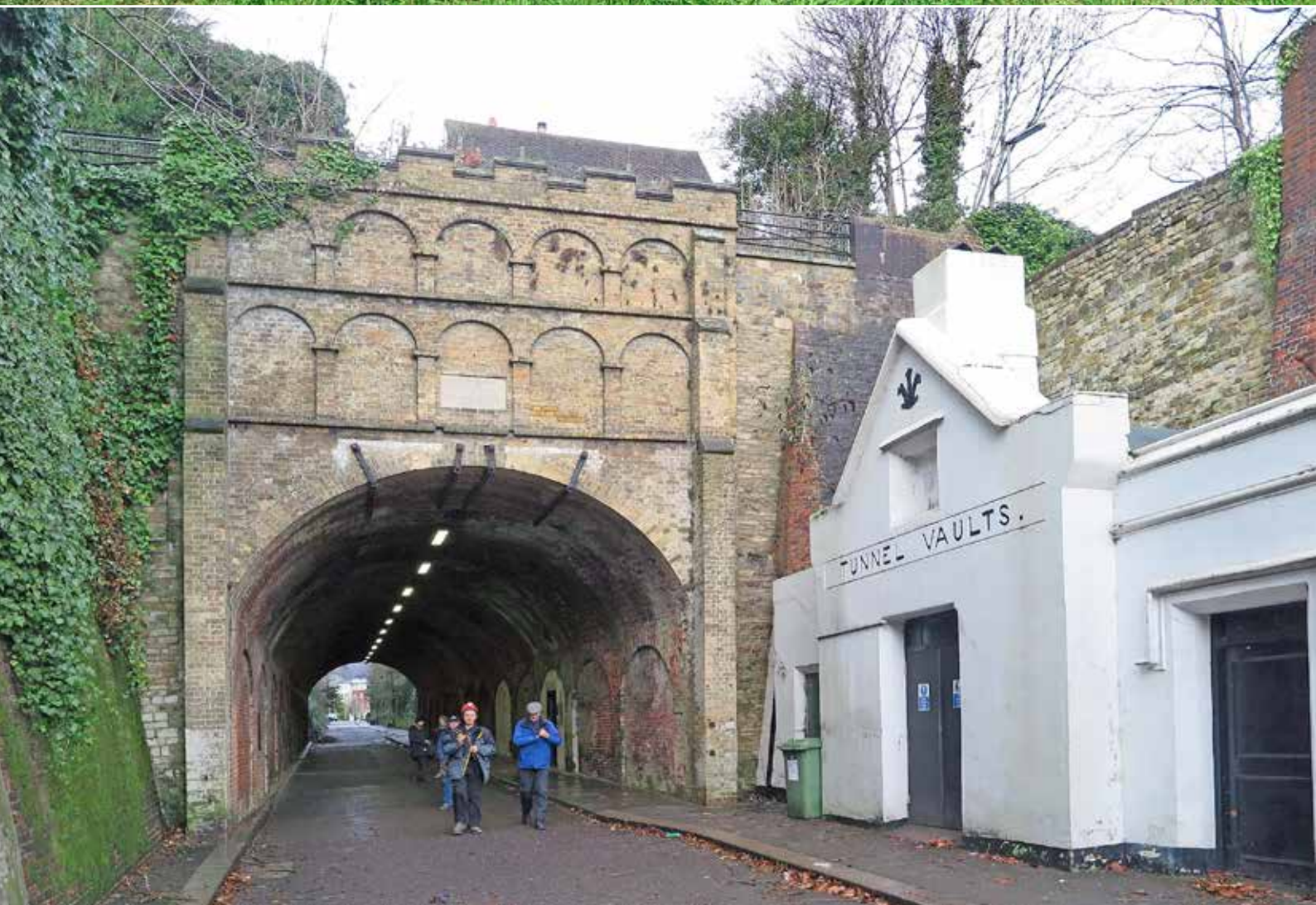
And if you don't want anything emailed to you – then we suggest you just browse the Forum!

How to log on to the Forum – reminder

* Go to https://community.subbrit.org.uk

* Log in using your membership username and password.

If you've forgotten them use 'Activate my account / Reset my password'.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